

Article IV.—FOSSIL TURTLES OF MONGOLIA^{1 2}BY CHARLES W. GILMORE³

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¹Publications of the Asiatic Expeditions of The American Museum of Natural History. Contribution No. 106.²While this manuscript was in press, we received from the Geological Survey of China a description of several species of turtles by Carl Wiman, *Palæontologia Sinica*, Series C, Vol. VI, Fascicle 3.

These genera and species are from the Hipparion fauna and the Cretaceous beds and, therefore, supplement the forms herein described, giving us a more complete picture of the Chelonian life.

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INTRODUCTION

This paper records the results of a study of the fossil turtles collected in Mongolia by the various Asiatic expeditions of the American Museum of Natural History up to the close of the year 1928. I wish here to express to Professor Henry Fairfield Osborn and to Mr. Walter Granger my great appreciation for the privilege of studying this most interesting collection.

The collection is not extensive and many of the specimens are fragmentary, but, coming from so remote a region, they possess an unusual interest. A wide geological distribution, ranging from the Lower Cretaceous upward into the Pliocene, is represented in the collection, which is devoid of individuals with outstanding peculiarities, such as one might expect to encounter in material from this region. In fact, the near resemblances between many of these extinct turtles and those from our own Rocky Mountain country, including a close similarity in geological distribution, is one of the outstanding disclosures.

Four families—the Dermatemydidae, Emydidae, Testudinidae and Trionychidae—have been recognized. These comprise eight genera and thirteen species, of which one genus and twelve species are new. That many undescribed forms occur in Mongolia is abundantly indicated by fragmentary specimens.

The abundance of chelonian life in the Upper Eocene and Oligocene deposits of Mongolia closely approximates conditions in North America, but the presence of the Dermatemydidae and Trionychidae in the Lower Cretaceous records a much earlier occurrence than is found on the American continent, where they are not known below the Upper Cretaceous.

The geological distribution of the chelonian life of Mongolia, so far as known at this time, is shown in the accompanying table.

The geologic table below, graphically presents the chronological distribution of the fossil turtles of Mongolia so far as they are known up to the close of the year 1928

Estimated Geologic Age	Formations	Approximate thickness in feet	Fossil Turtles
Pliocene	Tung Gur	500' +	? <i>Ocadia perplexa</i> , <i>Trionyx sculptus</i>
	P'ang Kiang	300' +	
	Hung Kureh	2000' ±	Emydid, gen. indet. ¹ Testudinid, gen. indet.
Miocene	Loh	100' +	
	Hsanda Gol	300' ±	
	Jirilgo	200' ±	
	Houldjin	40'	? <i>Testudo</i> ²
	Baron Sog	30'	
Lower Oligocene	Elegen	160' +	
	Ardyn Obo	500'	<i>Testudo insolitus</i> M. and G., <i>T. kaiserii</i> , <i>T. demissa</i> , Emydid, gen. indet., Trionychid, gen. indet.
	Ulan Gochu	200' ±	<i>Testudo nanus</i> , <i>Testudo</i> sp., <i>Palæochelys elongata</i> , <i>Sharemys hemispherica</i>

¹Andersson, J. G. 1922. Bull. Amer. Mus. Nat. Hist. XLVI, Art. 13, p. 737.

²Matthew, W. D., and Granger, Walter. 1923. Amer. Mus. Novitates, No. 97, p. 1.

Estimated Geologic Age	Formations	Approximate thickness in feet	Fossil Turtles
Eocene	Shara Murun	200' +	<i>Testudo</i> sp., Trionychid
	Tukhum	150' +	
	Ulan Shireh	150' +	<i>Anosteira mongoliensis</i> , <i>Testudo ulanensis</i> , ? <i>Amyda</i> sp., Trionychid, gen. indet., <i>Dermatemydid</i> , gen. indet.
	Irdin Manha	100' +	<i>Anosteira mongoliensis</i> , <i>Adocus orientalis</i> , ? <i>Amyda johnsoni</i> , <i>Testudo</i> sp., Trionychids.
	Kholobolchi	250' ±	
	Arshanto	100' ±	
Paleocene	Gashato	300'	Chelonian
Upper Cretaceous	Djadochta	500'	<i>Dermatemydid</i> , gen. indet.
Lower Cretaceous	Iren Dabast	80'	Trionychid, gen. indet.
	Dohoin Usu	300' ±	<i>Adocus</i> sp.
	Dubshih	1000' ±	
	Ochungchelo	2000' ±	
	Tairum Nor	100'	
	Baiying Bologai	150' +	
	Jasu Jergulung	100' ±	
	Go Yoto	250' ±	
	Shirigu	?	
	Oshih	2000' ±	
	On Gong	500' +	Trionychid, gen. indet., <i>Dermatemydid</i> ? gen. indet.
	Ondai Sair	500' +	<i>Dermatemydid</i> , gen. indet.

DESCRIPTION OF GENERA AND SPECIES

Family **DERMATEMYDIDÆ** Gray

The family Dermatemydidae is represented in the present collection by several fragmentary specimens. The genus *Anosteira* has certainly been recognized, and *Adocus* less surely. One specimen suggests affinities with the American *Hoplochelys*. The others are too incomplete to permit of more than family reference.

Genus **Anosteira** Leidy

Anosteira is typically a middle Eocene genus, having been established¹ on the species *Anosteira ornata* from the Bridger Basin of Wyoming. Subsequently in 1872, Cope added a second species, *A. radulina*, also from the Bridger formation. In 1888, a third species, *A. anglica*, from the Oligocene of England, was described by Lydekker. *Pseudotrionyx* from the Middle Eocene of Belgium is regarded by Hay as being closely related to *Anosteira*.

In America the genus ranges from the lowermost Bridger to the uppermost Uinta. The discovery of *Anosteira* in the Upper Eocene deposits of Mongolia is therefore fully in accord with its previously known geological history.

Anosteira mongoliensis, new species

Plate I, Figures 1, 2, 3, 4, 5

TYPE.—No. 6666, A. M. N. H., consists of the complete nuchal, parts of eight peripheral bones, some of which are complete, and the distal end of one costal. Collected in 1925.

TYPE LOCALITY.—North Mesa, Shara Murun region, Inner Mongolia.

HORIZON.—Ulan Shireh, Upper Eocene.

PARATYPE.—No. 6697, A. M. N. H., consists of the articulated hyoplastron, hypoplastron and xiphiplastron, attached to portions of the carapace rim of both sides. Collected by the Central Asiatic Expedition, 1928.

LOCALITY.—Chimney Butte, North Mesa, Shara Murun region, Inner Mongolia.

HORIZON.—Ulan Shireh, Upper Eocene.

DIAGNOSIS.—Nuchal much wider than long; sides of posterior lobe nearly parallel, with posterior extremity rounded to an obtuse pointed end.

The type material was found in association with the fragmentary shell parts of a large trionychid turtle, the whole lot bearing the field number (598). That the various bones here assigned to the type may represent parts of two individuals, is suggested by my inability to secure

¹Leidy, J. 1871. Proc. Acad. Nat. Sci. Phila., p. 102.

a contact between the nuchal and a bone regarded as the first peripheral of the right side.

The characteristic sculpturing on the surfaces of these bones at once indicates their affinities to be in the genus *Anosteira*. In size, and in the form of the individual bones, this specimen is nearest to *A. ornata* Leidy from the Bridger Eocene of Wyoming. Compared with specimen No. 4062 U. S. National Museum, regarded by Hay as one of the cotypes on which Leidy originally based the species, about the only distinctions between them are the stronger and better-defined sculpturing of the Mongolian specimen; the absence of the transverse undulating ridges from the costal surfaces, and a nuchal that is much wider than long. These slight differences in themselves would not perhaps justify its assignment to a new species, but when its distant geographical occurrence is taken into consideration, the establishment of the species *mongoliensis* for its reception appears justified. It seems most remarkable that turtles separated by thousands of miles should so closely resemble one another, but it is anticipated that the discovery of better preserved specimens will disclose other and more important differences.

The nuchal bone is complete and in a beautiful state of preservation (Plate I, fig. 1). It has a length at the center of 23.5 mm. and a width of 38 mm., whereas in a specimen of *A. ornata* described by Hay¹ these two diameters are subequal.

The free border is subacute; the thickness at the center is 5 mm. The anterior border is widely hollowed out for the neck. The upper side of the nuchal is regularly convex from side to side, the surface being exquisitely sculptured by sharp radiating ridges and rows of pustular elevations. In general these radiate from a focus placed near the center of each bone. The distal fragment of a costal bone, Pl. I, fig. 2, has its surface covered with low pustular elevations arranged more or less in rows that cross the costal diagonally, but there is no indication of the cross ridging which is such a distinctive feature of the costal ornamentation in *A. ornata*. The costals are thin. The anterior peripherals have subacute edges and smooth under surfaces, whereas the peripherals forming the bridge and those posterior to it are sculptured above and below, Pl. I, fig. 3. In general, the ridges and rows of pustules on the peripherals radiate from foci placed some distance back from the free borders. The pustules of the lower surfaces are smaller and the sculpturing is correspondingly delicate.

¹1908. "Fossil Turtles of North America," Carnegie Institution of Washington, p. 279.

A second specimen, No. 6697, A. M. N. H., from the same general region as the type, has the greater portion of the plastron preserved, and is here regarded as the paratype, Pl. I, fig. 5. The plastral bones are in excellent preservation, all being present except the ento- and epiplastron, and additional characters distinguishing the species from *Anosteira ornata*, with which it has its closest affinities, are disclosed.

To the plastron are attached peripherals four to ten inclusive of the right side; and the fifth, sixth, seventh and part of the eighth on the left

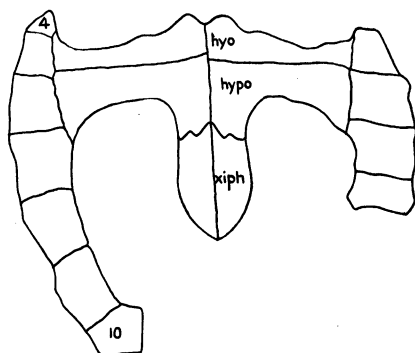


Fig. 1. Plastron of *Anosteira mongolien-sis*. Paratype. No. 6697, A. M. N. H.: *hyo*, hyoplastron; *hypo*, hypoplastron; *xiph*, xiphiplastron; fourth and tenth peripheral bones. One-half natural size.

side. As in *A. ornata*, the hypoplastron is in contact with the fourth and fifth; and the hypoplastron with the fifth, sixth and seventh (see fig. 1). In size and in sculpturing these peripherals are in perfect accord with the few preserved peripherals of the type.

The articulated plastral bones are strikingly like those of *A. ornata* as illustrated by Hay.¹ The principal differences in the Mongolian specimen are found in the form of the posterior lobe which has the two sides nearly parallel with a rounded but obtusely pointed distal extremity, whereas in *A. ornata* the sides of the lobe are regularly convergent toward the distal end, which is angularly but acutely pointed.

¹1908. "Fossil Turtles of North America," Carnegie Institution of Washington, p. 280, fig. 353.

COMPARATIVE MEASUREMENTS OF PLASTRA

	<i>A. mongoliensis</i> No. 6697 A. M. N. H.	<i>A. ornata</i> No. 6132 A. M. N. H.
	mm.	mm.
Minimum width of bridge	15	15
Width of hyoplastron on bridge	4	4
Greatest width of hyoplastron fore and aft	11	11
Greatest width of hypoplastron fore and aft	31	21
Greatest width of xiphiplastron fore and aft	30	27

The surfaces of the plastral bones are marked by faint sculpturing that appears most distinct on the bridges. This ornamentation consists of faint ridges and intervening grooves that on the bridge run transverse to the length of the body. Sculpturing is barely discernible on the xiphiplastral bones. No trace of sulci outlining the form of the epidermal scutes is found.

A third occurrence of this same species is indicated by a median and a posterior peripheral (No. 6602 A. M. N. H.) found by the expedition of 1923, near the Telegraph Line Camp, Irdin Manha, Inner Mongolia, in the Irdin Manha, Upper Eocene.

A pygal bone, No. 6703, A. M. N. H., found with fragments of a trionychid turtle, No. 6713, A. M. N. H., clearly pertains to the genus *Anosteira*. It was found in the Ulan Shireh beds, at Chimney Butte (not from quarry), North Mesa, Shara Murun Region, Mongolia, by the Central Asiatic Expedition in 1928.

***Adocus orientalis*, new species**

TYPE.—No. 6356, A. M. N. H. Type. Consists of the nearly complete anterior half of the plastron. Collected by George Olsen, 1923.

TYPE LOCALITY.—Telegraph Line Camp, Irdin Manha, Inner Mongolia.

HORIZON.—Irdin Manha, Upper Eocene.

The presence of large intergular scutes, wide entoplastron, a vermiculated sculpturing of the plastral surface, and the widely meandering course of the median longitudinal sulcus form a combination of characters indicative of the dermatemydid affinities of the type of the present species.

In size, in the contour of the anterior lobe, and in the extent and arrangement of both the plastral scutes and bones, this specimen is so fully in accord with *Adocus punctatus* Marsh that I have little hesitancy

in referring it to the genus *Adocus*. Intergulars overlapping front of entoplastron and vermiculate sculpturing are features that distinguish *A. orientalis* and *A. punctatus*, to which it seems most closely allied. (Compare figures 2 and 3.)

The part preserved is 180 mm. long, and it is estimated that the complete plastron would have been about 390 mm. in length.

The anterior lobe is truncated. The entoplastron is 81 mm. wide and 51 mm. long.

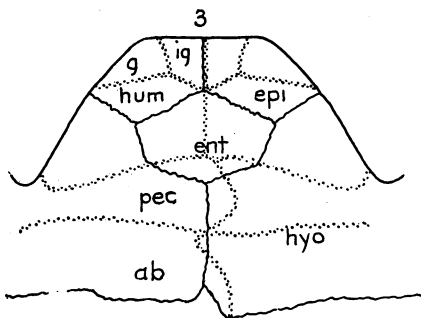
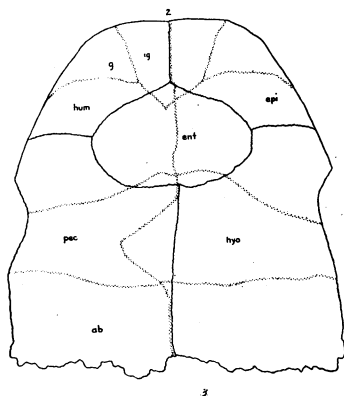


Fig. 2. Anterior half of plastron *Adocus orientalis*, No. 6356, A. M. N. H. Type. *ab*, abdominal scute; *ent*, entoplastron; *epi*, epiplastron; *g*, gular scute; *hum*, humeral scute; *hyo*, hyoplastron; *ig*, intergular scute; *pec*, pectoral scute. One-fourth natural size.

Fig. 3. Anterior half of plastron, *Adocus punctatus* Marsh. Type. One-fourth natural size. After Hay.

The median longitudinal sulcus runs a meandering course so typical of dermatemydids in general. All the sulci are narrow and shallow. The intergulars are large and overlap the forward end of the entoplastron. They are 46 mm. long on the midline; the humerals occupy 34 mm. of the midline; the pectorals 53 mm., and the pectoral-humeral sulcus crosses the posterior end of the entoplastron as shown in figure 2. The gulars have been crowded wide apart by the intergulars, and their posterior ends do not reach the entoplastron.

Additional materials are needed before this species can be fully characterized, but its distant geographical occurrence seems to justify its establishment, fragmentary though the type may be.

***Adocus* sp.**

A fragmentary turtle specimen (No. 6676, A. M. N. H.) consisting of various broken parts of the carapace and plastron, collected from the Dohoin Usu, ?Lower Cretaceous, beds northeast of Shabarakh Usu, Outer Mongolia, in 1925, is provisionally identified as pertaining to the genus *Adocus*. This identification rests entirely upon the surface sculpture, as none of the bones is sufficiently perfect to permit adequate comparisons to be made with known forms. The sculpturing consists of rows of shallow pits that have a diagonal trend across costal and peripheral bones. These rows of pits form an ornamentation that so far as American turtles are concerned is distinctive of the genus *Adocus* for which reason only is the Mongolian specimen thus referred. In America, *Adocus* is largely confined to the Upper Cretaceous, although it ranges upward into the Torrejon and Puere formations of the Paleocene.

Dermatemydids, gen. indet.

The presence of a member of the Dermatemydidae in the Ulan Shireh beds, Upper Eocene, is indicated by incomplete plastral bones, No. 6712, A. M. N. H., found in 1928 in the Chimney Butte Quarry, North Mesa, Shara Murun region, Inner Mongolia.

The plastral bones consist of the left hyoplastron, the left hypoplastron articulated with the greater portion of the xiphioplastron of that side. Since the sutural contacts of the hyo- and hypoplastra do not coincide, it is concluded that two individuals are represented. The materials are too meager for satisfactory comparison or description. The bones are extremely thin, nowhere exceeding 4 mm. in thickness. The presence of a long straight suture across the bridge for union with the peripherals; a full set of marginal scutes; a scar for the pubis on the posterior lobe, and the fact of the horny shield not passing on to the upper surface of the lobes are an array of characters quite sufficient to establish the affinities of this specimen as being in the family Dermatemydidae.

A miscellaneous lot of fragments, No. 6664, A. M. N. H., collected in 1925 by Berkey and Morris from the Ondai Sair formation, Lower Cretaceous, at Uskuk, represent the most ancient turtle remains yet found in Mongolia, if their geological occurrence has been correctly determined.¹

¹A letter of February 4, 1928, from Mr. Walter Granger, says of this specimen: "One lot of yellowish colored fragments labelled as being collected by Berkey and Morris in the Ondai Sair (Cretaceous) beds of the Uskuk region, may not be from the Cretaceous, but from an overlying Tertiary horizon—I can't be sure."

The material consists of a great number of small pieces of carapace and plastron, representing several individuals. All attempts at restoration have proven futile, as no two pieces were found that certainly go together. A study of these fragmentary remains shows resemblances in the peripherals and plastral bone fragments to those of the American *Hoplochelys*, and regardless of the uncertainty of their generic affiliations, the plastral fragments indicate their affinities to lie in the Dermatemydidae, and as the oldest Mongolian representative of this family these fragments are at least of interest.

The presence of turtles in the Djadochta formation, Upper Cretaceous, is shown by two fragmentary specimens, Nos. 6658 and 6659, A. M. N. H., found in 1925 at Shabarakh Usu, Mongolia. Although in each instance a considerable portion of the carapace is preserved, the specimens are practically valueless from a systematic standpoint. Not only is the preservation bad but the recognizable parts offer no basis for their proper identification or study. All of the carapace bones are highly sculptured with shallow pits, that in some areas are arranged in indistinct rows. The ornamentation as a whole is strongly suggestive of that found in the Dermatemydidae, and it seems highly probable that the affinities of these two specimens lie in this family.

Family **EMYDIDÆ**

Genus *Palæochelys* H. von Meyer

Palæochelys bussenensis H. VON MEYER, 1847. Jahresh. Ver. Nat. Wurt. Vol. 3, p. 167, Pl. I, fig. 11.

A genus established on a specimen from the Lower Miocene (Upper Oligocene) of Wurtemberg and to which *Emys portisi* Sacco from the Lower Pliocene of Piedmont has been referred by Lydekker.¹

Lydekker defines the genus as follows:

"Neural bones of moderate length, the first oblong, the second hexagonal with short antero-lateral surfaces, the third octagonal, the fourth tetragonal, and the fifth octagonal. Plastron extensively united to the carapace by suture, with strong axillary and inguinal buttresses; sulcus between humeral and pectoral shields cutting entoplastral bones."

In this genus I would now include the species described below. Its provisional reference to *Palæochelys* is based on resemblances in the form and arrangement of the neural bones; non-differentiated costal plates; general form of the carapace, and its somewhat similar geological occurrence. Further confirmation of the correctness of this assignment seems

¹1889. "Catalogue of Fossil Reptilia and Amphibia in the British Museum," Pt. 3, p. 101.

to be found in the plastron, which differs only in minor details from that of the referred species, *P. portisi* (Sacco).¹ The plastron of *P. bussenensis* is not available for comparison.

Regardless of the tentative nature of the generic assignment of this new species, its affinities appear to be with those emydids found living in China, southern Asia, and the East Indies, rather than with any of the American members of the family either living or extinct. This fact seems to be indicated by the high differentiation of the neural bones and especially in the posterior position of the short side of the hexagonal ones. In all of the many Emydidae, only *Echmatemys haydeni* Hay² shows such a condition, but other features effectually exclude the Mongolian specimen from that genus.

***Palaeochelys? elongata*, new species**

Plate II

TYPE.—No. 6698, A. M. N. H., consists of more than the longitudinal left half of the carapace and a nearly complete plastron. Collected by the Central Asiatic Expedition, 1928.

TYPE-LOCALITY.—Nom Khong Obo (Holy Mesa), Inner Mongolia.

HORIZON.—Ulan Gochu, Lower Oligocene.

DIAGNOSIS.—Shell emydid, depressed, top flat in profile, with a low, somewhat obscure interrupted keel; neurals usually broader than long, highly differentiated in form; marginal sulcus coincident with peripheral suture; costals having upper and lower ends of about equal width; plastron deeply notched behind; epiplastron, wide, slightly protruding, spout-like above; pectoral humeral sulcus passing behind entoplastron; axillary marginal scute large.

Carapace elongate, sides nearly parallel, anterior end broadly rounded, posterior obtusely pointed; profile of shell above straight. The carapace has a greatest length of about 240 mm., a greatest width of about 178 mm. The neurals are of moderate length, usually wider than long. They vary much in form: the first oblong; the second hexagonal, short lateral border in front; third octagonal; fourth hexagonal, short lateral border behind; fifth quadrangular; sixth octagonal; seventh trapezoidal, and eighth hexagonal. Their dimensions are given in the table.

¹1889. Mem. Acad. R. Torino, Vol. XXXIX, p. 433, Pls. I and II.

²1908. "Fossil Turtles of North America," p. 315, fig. 407.

MEASUREMENTS OF NEURALS

Neural	Length	Width
	mm.	mm.
1	29	22
2	22	22
3	25	26
4	24	26
5	20	24
6	19	26
7	12	21
8	12	18

The first suprapygal is 21 mm. long and 22 mm. wide; the second suprapygal 23 mm. long and 50 mm. wide. At intervals on the neurals there are traces of a low, broadly rounded interrupted keel, and again on the upper third of the costals there is a suggestion of a low keel which in the young might show a tricarinate carapace as in some European emydids. The costal bones present no considerable difference in the width of their opposite ends. The shell is devoid of sculpture, aside from some few longitudinal grooves and ridges cutting across the lower halves of the costals.

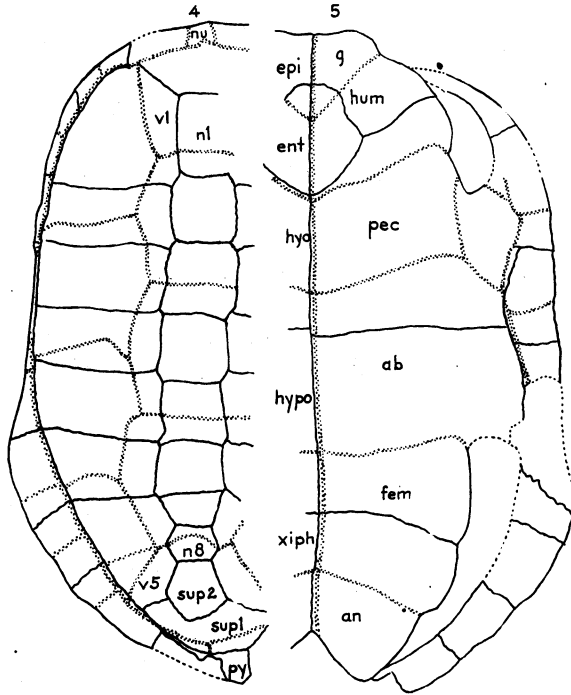
The free peripheral bones are thin with acute edges, the posterior ones being gently recurved and slightly scalloped. The peripherals of the bridge are crossed by an obtuse keel running from the anterior to the posterior free peripherals. The bridge peripherals are more extensive below than above this keel.

The sulci marking the dermal scutes are everywhere well impressed. The vertebrae are hexagonal, all being wider than long. Their form is well shown in figure 4; their dimensions are given in the table.

MEASUREMENTS OF VERTEBRAE

No.	Length	Width
	mm.	mm.
1	44	50
2	44	47
3	46	50
4	43	56
5	45	55

The nuchal is small, subquadrangular, 8.5 mm. long, 9 mm. wide. The marginal sulcus is coincident with the peripheral suture, except when it crosses the pygal, where it runs above.



Figs. 4 and 5. Carapace and plastron, *Palaeochelys elongata*. Type. No. 6698, A. M. N. H. *ab*, abdominal scute; *an*, anal scute; *ent*, entoplastron; *epi*, epiplastron; *fem*, femoral scute; *g*, gular scute; *hum*, humeral scute; *hyo*, hyoplastron; *hypo*, hypoplastron; *n 1*, *n 8*, neurals one and eight respectively; *nu*, nuchal scute; *pec*, pectoral scute; *py*, pygal; *sup 1*, *sup 2*, suprapygals one and two respectively; *v 1*, *v 5*, vertebrae one and five respectively; *xiph*, xiphiplastron. About one-fourth natural size.

The plastron at the center measures 214 mm. in length. Anterior lobe has a length of 56 mm., width at base 114 mm. The anterior lip projects slightly beyond the general curvature of the lobe. Viewed from above the lip is concave from side to side, spout-shaped.

The entoplastron has a length of 55 mm. and a width of 36 mm. The bridge is 90 mm. wide, and thus exceeds the posterior lobe in length. The posterior lobe has a length of 70 mm., a width at the base of 108 mm. The posterior notch of the plastron has a width of 32 mm. and a depth of 18 mm.

The gular scutes are 33 mm. long; the humerals 25 mm., the pectorals 33 mm., the abdominals 57 mm., the femorals 42 mm., the anals 23 mm., all measured along the midline. The large axillary scute has an acutely pointed posterior end that extends posteriorly nearly to the hyo-hypoplastral suture (see figure 5).

***Ocadia? perplexa*, new species**

Plate III

TYPE.—No. 6699, A. M. N. H., consists of the posterior left half of the carapace and the complete posterior half of the plastron. Collected by Central Asiatic Expeditions, 1928.

TYPE-LOCALITY.—North rim of Tairum Nor Basin, Inner Mongolia.

HORIZON.—Tung Gur, Pliocene.

DIAGNOSIS.—Shell emydid; posterior neurals short, very broad, hexagonal; vertebrals broad, axillary buttress articulating strongly with fifth and sixth costal bones; marginal sulcus well below costo-peripheral suture; all bones of carapace thin; plastron deeply notched on posterior end.

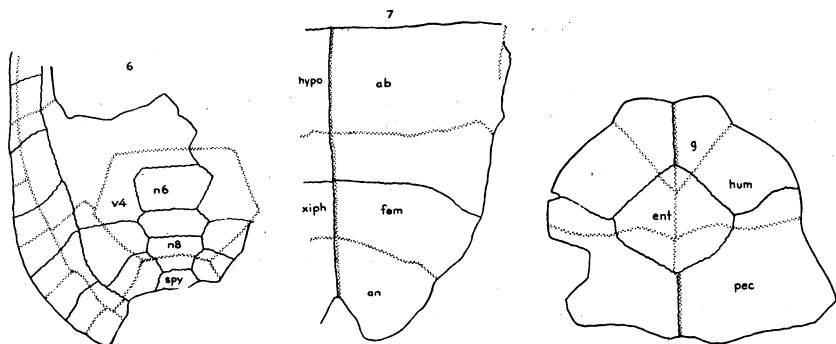
In provisionally referring the present species to the genus *Ocadia*, I do so on the ground that most of the characters disclosed by the fossil agree with the diagnosis of the genus. If differences are found in the remaining parts of the shell when they are ultimately discovered, then grounds will be available for its generic separation.

The inguinal buttress ascends above the peripherals and articulates strongly with the fifth and sixth costals, which is in accord with this assignment and excludes reference of the specimen to such other emydid genera as *Clemmys* and *Nicora*, which, like *Ocadia*, are represented in the reptilian fauna of Asia to-day.

The incomplete type specimen is illustrated in Plate III, and such parts as are preserved are in excellent condition. The shell is somewhat vaulted, and posterior to the mid-length, has its greatest transverse diameter of 206 mm. Of the central part of the carapace, only the sixth, seventh and eighth neurals can be determined in their entirety (Fig. 6). These are short antero-posteriorly, hexagonal in shape, and broad. The sixth is 19 mm. long, and 37 mm. wide; the seventh 12 mm. long and 32 mm. wide; the eighth 20 mm. long and 27 mm. wide. There is no trace of a median keel.

The free posterior peripheral bones are large, thin, slightly recurved, with acute edges. The ninth is the longest, measuring 57 mm., with a greatest width antero-posteriorly along the free border of 33 mm. The peripherals posterior to the eighth are all longer than the abutting costal bones. The costal plates are relatively thin. The axillary buttress ascends about one-third the distance from the lower borders of the costals to their upper ends. The buttress articulates with both the fifth and sixth costals, as in *Ocadia sinensis* Gray.

The sulci are shallow but plainly impressed. The fourth vertebral has the following dimensions: length 51 mm., width 84 mm. The



Figs. 6 and 7. Carapace and plastron of *Ocadia? perplexa*. Type. No. 6699, A. M. N. H. *ab*, abdominal scute; *an*, anal scute; *fem*, femoral scute; *hypo*, hypoplastron; *n 6*, *n 8*, neurals six and eight; *spy*, suprapygal; *v 4*, fourth vertebral; *xiph*, xiphiplastron. One-third natural size.

Fig. 8. Anterior lobe, *Ocadia? perplexa*, No. 6702, A. M. N. H. *ent*, entoplastron; *g*, gular scute; *hum*, humeral scute; *pec*, pectoral scute. One-third natural size.

marginal sulcus runs far below the costo-peripheral suture on all the peripherals present, a feature that at once distinguishes this species from the other members of the genus.

The plastron is complete from the hypo-hypoplastral suture posteriorly. The length of the posterior lobe at the midline is 128 mm., its width 147 mm. There is a posterior notch which has a width of 27 mm. and a depth of 20 mm. The beveled horn-covered surface on the upper side of this lobe has a width at the hypo-xiphiplastral suture of 26 mm. On the midline, the hypoplastra measures 71 mm. in length; the xiphiplastron 56 mm. The free edge of the lobe is everywhere acutely edged. There is a decided constriction of the lobe at the femoral-anal sulcus (Fig. 7). The anal scutes are 28 mm. long, the femorals 48 mm.

A second specimen (Fig. 8), represented by a complete anterior plastral lobe, No. 6702, A. M. N. H., is provisionally referred to this same species. It has the same history of occurrence and discovery as the type specimen. If correctly referred, it furnishes the following information regarding the anterior lobe. Epiplastral lip 47 mm. wide, protruding 12 mm. beyond the general contour of the lobe; shallowly spout-like; entoplastron lozenge-shaped; overlapped by gular scutes and crossed by the humeral pectoral sulcus. Width of anterior lobe at base, 116 mm.

Epiplastra 27 mm. long on midline; entoplastron 40 mm. long and 47 mm. wide.

Genus *Sharemys*, nov.

The characters distinguishing this new genus of emydid turtle will be found in the diagnosis of the species.

Sharemys hemispherica, new species

Plate IV

TYPE.—No. 6694, A. M. N. H., consists of a nearly complete carapace and plastron. Collected by Kan in 1928.

TYPE LOCALITY.—Twin Obes, East Mesa, Shara Murun region, Inner Mongolia.

HORIZON.—Ulan Gochu, Lower Oligocene.

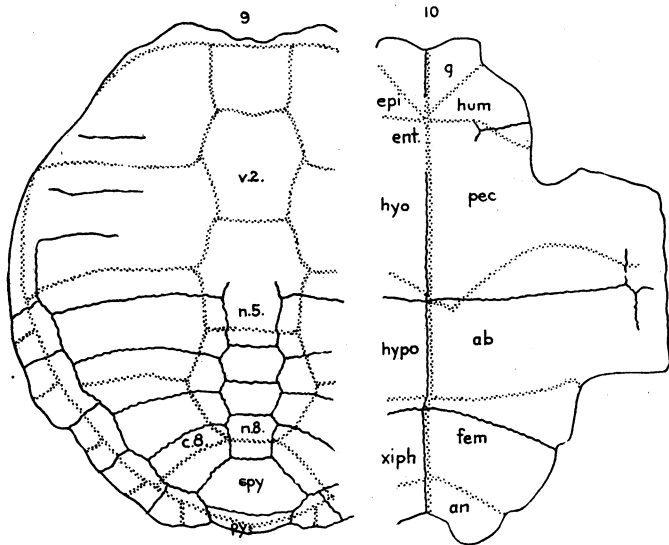
PARATYPE.—No. 6693, A. M. N. H., consists of a nearly complete shell. History same as the type.

DIAGNOSIS.—Shell small, subhemispherical in outline; deeply notched on anterior border; marginal sulcus everywhere below peripheral suture; marginal sulcus crossing pygal; eighth neural large, crossed posterior to middle by vertebral sulcus; plastron notched at both ends; slightly protruding epiplastral lip; pectoral-abdominal sulcus at middle extending posterior to the hyo-hyoplastral suture; humeral-pectoral sulcus crossing entoplastron far forward; pectoral scute on midline twice the length of the abdominal; width of bridge greater than length of posterior lobe.

The type specimens are of the same size, and they so supplement one another that much of the detailed shell structure can be determined. The slightly concave plastron with projecting epiplastral lip strongly suggests that the type specimen is a male, while the paratype with a flat plastron is probably a female.

In outline the shell is hemispherical (see Plate IV), moderately arched in all directions, with a deeply notched anterior border. The surface of the shell, except for slight ridgings across the costals, is smooth, with no suggestion of a median keel. In length the carapace measures 148 mm. at the center; greatest width 137 mm. The peripherals are relatively thin, slightly everted, and everywhere their free borders are acutely edged.

Only the posterior neurals of the type are distinguishable, and these are all hexagonal in form, as well shown in figure 9. The eighth neural is especially large, measuring 16 mm. in length, with a greatest breadth of 14 mm. It is crossed posterior to its mid-length by the vertebral sulcus. The sulci are everywhere shallowly impressed.



Figs. 9 and 10. Carapace and plastron of *Sharemys hemispherica*. Type. No. 6694, A. M. N. H. *ab*, abdominal scute; *an*, anal scute; *c 8*, eighth costal; *ent*, entoplastron; *epi*, epiplastron; *fem*, femoral scute; *g*, gular scute; *hum*, humeral scute; *hypo*, hypoplastron; *n 5*, fifth neural; *n 8*, eighth neural; *pec*, pectoral scute; *py*, pygal; *spy*, suprapygals; *v 2*, second vertebral scute; *xiph*, xiphiplastron. About one-half natural size.

The costals show no unusual characteristics. There is a single hexagonal suprapygals. The pygal is narrower than the peripherals on either side of it, and is crossed by the marginal sulcus. The costo-marginal sulcus runs considerably below the costo-peripheral suture wherever it can be observed.

The vertebrae are about as broad as long, and urn-shaped. Their dimensions are given in the table:

No. of Vertebrales	Length		Width	
	No. 6694	No. 6693	No. 6694	No. 6693
	mm.	mm.	mm.	mm.
1	31	34	..	..
2	30	34	30	27
3	30	29	31	30
4	32	29	35	32
5	34	..	46	..

The nuchal scute cannot be recognized.

The plastron is 132 mm. long and notched at both ends. The anterior lobe is 34 mm. wide at the base and 37 mm. long. The epiplastral lip is 30 mm. wide and projects 7 mm. beyond the general curve of the lobe. The upper surfaces of the epiplastra are shallowly concave transversely and the anterior edge is subacute. These have a greatest thickness near their transverse edges of 4 mm.

The bridge is 60 mm. wide. The form of the entoplastron cannot be determined in either specimen.

The posterior lobe is 37 mm. long, and 89 wide at the base; posteriorly there is a deep notch. The gular scutes are 18 mm. long, the humerals 4 mm., the pectorals 50 mm., the abdominals 27 mm., the femorals 20 mm., the anals 11, all measured along the midline. The gulars apparently overlap the entoplastron.

One of the outstanding features of the plastron of *Sharemys hemispherica* is the great development of the pectoral scutes which at the center extend backward on to the hypoplastron (Fig. 10). The paratype shows the same condition. In this species the pectoral scutes at the midline have a length in excess of the combined abdominals and femorals, a condition which I have been unable to find duplicated in any emydid turtle, either living or extinct.

Emydid, gen. indet.

A complete nuchal bone of a small emydid, No. 6605, A. M. N. H., illustrated on Plate I, fig. 6, shows the presence of this family in the Ardyn Obo formation, Lower Oligocene. The sculptured surface is slightly suggestive of the genus *Trachemys*. This specimen was collected in 1923 on the Chinese Post-road, Ardyn Obo, Outer Mongolia.

Family **TESTUDINIDÆ****Testudo insolitus** Matthew and Granger

Amer. Museum Novitates, No. 98, December, 1923, p. 5.

Plate V and Plate 8, Fig. 1

DIAGNOSIS.—Large size, shell highly arched, declivous in front; bone moderately thick; surfaces heavily undulate; anterior border shallowly concave with angular notch at center; sulci on costals running in grooves with raised edges; marginal sulcus coincides with costo-peripheral suture; front lobe of plastron not produced but thickened and without excavation in rear; pecto-humeral sulcus crossing behind entoplastron; entoplastron hexagonal; pectoral scute about one fifth the length of abdominal scute at center.

The type material bearing the catalogue number 6275, A. M. N. H., consists of portions of three median peripherals; a posterior peripheral; distal portion of a third costal plate, and two left hyoplastra. At least two and possibly three individuals are represented in these fragmentary materials, all of which were collected by Walter Granger in 1922 from Promontory Bluff, Ardyn Obo formation, Lower Oligocene.

Matthew and Granger distinguished this species on the supposed uniform width of the median costal plates and on the fact that the borders of the marginal shields were marked off by raised ridges with deep median furrows.

That the raised character of the scutal grooves is not distinctive of this species, is clearly indicated by Hay's description¹ of *Testudo latincunea* Cope, where he says: "The sulci of the carapace are narrow grooves with raised edges." Recent specimens of the species *T. radiata* and *T. abingdonii* in the U. S. National Museum show this same characteristic.

A restudy of the cotypes has proven unsatisfactory from a taxonomic standpoint, as I am unable to find structural features that effectually distinguish the species from other members of the genus. Since its remote geographical occurrence probably justified its original establishment, it would seem best to continue the species in the hope that the discovery of more complete specimens will disclose its specific characteristics.

With one exception, *Testudo insolitus* can be satisfactorily distinguished from the other species of *Testudo* in the present collection. Careful comparison shows that specimens Nos. 6350 and 6353 can quite certainly be referred to the present species, while No. 6351 may be provisionally associated with it. If correct in these assignments, the

¹1908. "Fossil Turtles of North America," p. 404.

specimens contribute considerably to our knowledge of the detailed structure of the carapace and plastron.

The two hypoplastra belonging with the original type material, although differing in size, agree in having narrow pectoral scutes, with

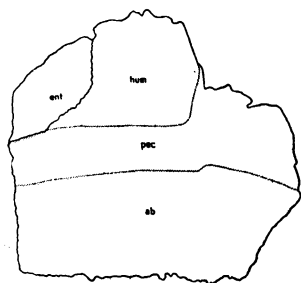


Fig. 11

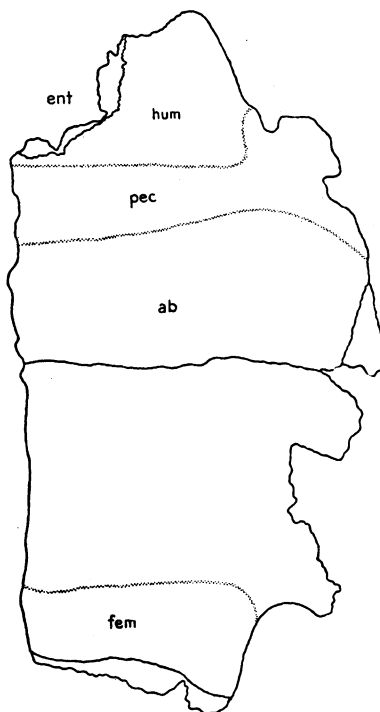


Fig. 12

Fig. 11. Left hyoplastron of *Testudo insolitus*, No. 6275, A. M. N. H. Cotype. *ab*, abdominal scute; *ent*, entoplastron; *hum*, humeral scute; *pec*, pectoral scute. One-fourth natural size.

Fig. 12. Left half of plastron, *Testudo insolitus*, No. 6350, A. M. N. H. *ab*, abdominal scute; *ent*, space occupied by entoplastron; *fem*, femoral scute; *hum*, humeral scute; *pec*, pectoral scute. One-fourth natural size.

the humeral-pectoral sulcus running posterior to the entoplastron, as shown in figure 11. Specimen No. 6350, A. M. N. H., from the Ardyn Obo formation, Ardyn Obo, Chinese Postroad, Outer Mongolia, consisting of the left hyo- and hypoplastron (see figure 12) except for its larger size, agrees in every particular with the cotypes, and leaves no doubt of their being conspecific. These bones measure 360 mm. from the

epiplastral to the xiphiplastral suture; the bridge has a width of 258 mm.; the pectoral scute at the center of the plastron is 35 mm. wide, the abdominal 180 mm.

Specimen No. 6353, A. M. N. H., from the same formation and locality as No. 6350, A. M. N. H., consists of the median anterior portion of the carapace, a complete costal plate, a posterior peripheral and the right half of the epiplastron. The reference of this specimen to the present species rests almost entirely upon resemblances in the costal plates. These similarities consist in their being of the same relative size, same thickness of bone, and sulcus deep with raised borders. This

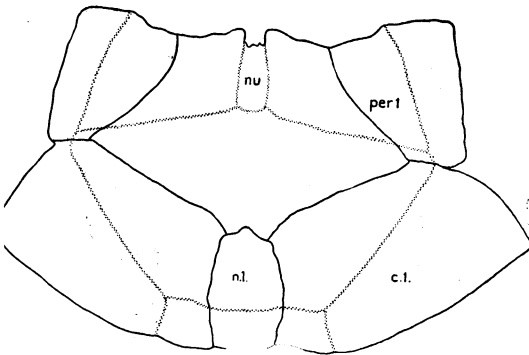


Fig. 13

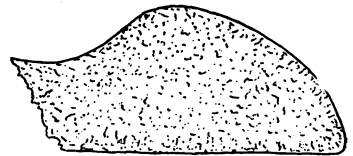


Fig. 14

Fig. 13. Anterior median portion of the carapace of *Testudo insolitus*, No. 6353, A. M. N. H. *c l*, first costal plate, *n l*, first neural; *nu*, nuchal scute; *per l*, peripheral one. About one-fourth natural size.

Fig. 14. Cross section of epiplastral bone, No. 6353, A. M. N. H. One-third natural size.

costal, probably the fourth of the right side, is complete, and has a greatest length, measured over the curve, of 285 mm., a width at the distal end of 95 mm., and 55 mm. at the proximal extremity, thus indicating that the costal plates alternate in width as they do in many American Oligocene species.

Associated with this costal is the median anterior portion of a carapace, illustrated in figure 13 and Plate VIII, fig. 1. The median anterior border of the shell is shown to have been shallowly concave with a narrow but distinct nuchal notch. The free edge is everywhere acute. The nuchal bone occupies 80 mm. of the free border, and its greatest width is about 174 mm. The first neural is subovate in outline with a distinct median peg-like projection on its anterior end. The first peri-

pherals are 73 mm. wide on the free border and without eversion. The nuchal scute is 32 mm. long, and 32 mm. wide at the middle. The first vertebral is especially broad, a feature that at once distinguishes this species from *Testudo kaiseni* about to be described. This scute is 197 mm. wide and 105 mm. long. The second vertebral scute measures 83 mm. in width at the anterior end.

The right epiplastral bone, if correctly associated with this individual, shows that the lip did not project beyond the general curvature of the lobe, thus resembling *T. pansa* Hay¹ in this respect. From the subacute free border of the lip, the bone rises on the upper side to a thickness of 40 mm. and then rapidly drops off behind as shown in figure 14. There is no notch where the gulo-humeral sulcus crosses the border.

Specimen No. 6351, A. M. N. H., which I have tentatively referred to the present species, consists of a little more than the anterior half of an articulated carapace and plastron, Plate V, fig. 1. Its smaller size and much thinner bone give rise to some doubt as to the correctness of the specific assignment. The hyoplastron, although equaling in size the smaller of the two cotypes, is only about one-half the thickness of the typical specimen. These differences, however, may possibly be attributed to immaturity of the individual. The juvenile character of the specimen seems to be indicated by the open sutures, but more especially by the strongly marked growth lines that cross the lower ends of the costals and the median portions of the plastral bones. While similar markings are also present on the larger individuals, they are much less clearly defined.

The chief importance of the specimen is the information derived as to the general form of the shell as shown in Plate V, figure 1. The carapace is highly and broadly arched in all directions, steeply inclined in front, without eversion of the anterolateral peripherals. The costal plates are alternately wide and narrow, and the median peripherals are high and stand nearly vertical. The free anterior border of the carapace

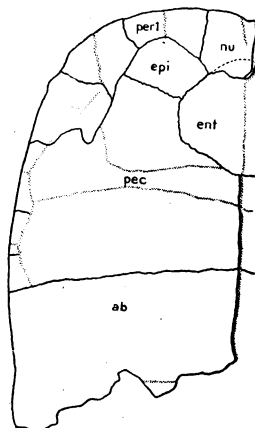


Fig. 15. Plastron of *Testudo insolitus?* No. 6351, A. M. N. H. *ab*, abdominal scute; *ent*, entoplastron; *epi*, epiplastron; *nu*, nuchal scute; *pec*, pectoral scute; *per 1*, first peripheral. About one-fourth natural size.

¹1908. "Fossil Turtles of North America," p. 421, Fig. 551.

is everywhere acute, but less widely excavated than in specimen No. 6353. This border is also notched in front of the nuchal scute.

The plastron lacks the epiplastral lip as well as the entire posterior lobe, but in its main features it is in accord with the other referred specimens. The entoplastron is hexagonal in outline, with its two diameters subequal. The pectoral scute is narrow, and pectoral-humeral sulcus runs posterior to the entoplastron (see figure 15). The extreme flatness of the plastron suggests this individual to be a female.

All three of these referred specimens come from the Ardyn Obo formation, and all were collected in 1923, on the Chinese Postroad, Ardyn Obo, Outer Mongolia.

***Testudo kaiseni*, new species**

Plate VI

TYPE.—No. 6352, A. M. N. H., a nearly complete carapace and plastron. Collected by Peter Kaisen, 1923.

TYPE LOCALITY.—Ardyn Obo basin, Chinese Postroad, Outer Mongolia.

HORIZON.—Ardyn Obo, Lower Oligocene.

DIAGNOSIS.—Medium size, carapace broader behind than in front; shell highly arched, declivous behind; surfaces slightly undulating; anterior border truncate, feebly notched; sulci shallowly impressed; marginal sulcus coinciding with costo-peripheral suture; front lobe of plastron apparently not produced; pecto-humeral sulcus crossing on posterior half of entoplastron; entoplastron subquadrangular; gular scutes overlapping entoplastron; pectoral scute somewhat shorter than abdominal scute on median line; posterior lobe angularly and widely notched on hind border; lateral borders of lobe undulating.

The specimen selected as the type of this new species is the most perfect turtle shell yet found in the Ardyn Obo deposits. The antero-lateral and posterior peripherals are but little everted. The surface is slightly undulating, but without bosses or other ornamentation. The median anterior border of the shell is very shallowly notched. The length of the carapace taken in a straight line is about 422 mm. The neural bones vary considerably in form, the first being suboval, second and fourth octagonal, the third and fifth quadrangular, and the sixth hexagonal. The posterior neurals are missing. The dimensions of the neurals are given in the table below:

DIMENSIONS OF NEURALS

No.	Greatest Length	Greatest Width
	mm.	mm.
1	48	31.0
2	36	53.5
3	37	42.5
4	37	55.0
5	35	50.0
6	29 ¹	60.0

The costals are alternately wide and narrow. The form of the bones of the carapace will be best understood from the illustrations (see figure 16). The pygal region is so badly abraded from weathering that it cannot be certainly determined whether there were two or three pygal bones.

The outlines of the scutes are marked out by shallow grooves, many of which are nearly obscure. The nuchal scute has a greatest width of 18 mm., a length of 22 mm. The marginal scutes, as in most other species of *Testudo*, rise to the sutures between the peripherals and costals. The vertebral scutes are wide, especially those posterior to the first. Their dimensions are given in the table.

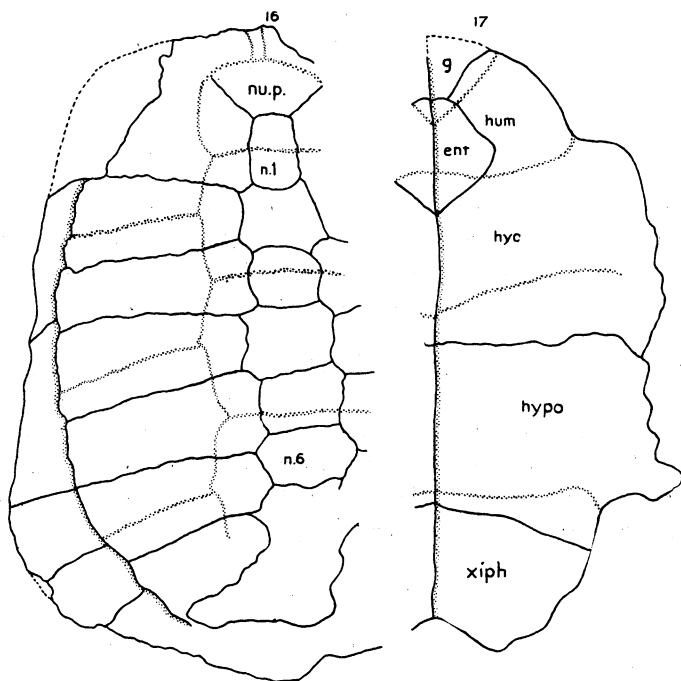
MEASUREMENTS OF VERTEBRALS

No.	Length	Width
	mm.	mm.
1	75	87
2	75	97
3	86	107
4	..	111

The plastron is complete except for the loss of the median portion of the epiplastral lip (see Plate VI, fig. 2), and a small portion from the anterior outer border of the right hypoplastron. The plastron has an estimated length of 370 mm. The estimated length of the anterior lobe is 70 mm., width at the base 168 mm. The missing lip may have projected slightly. The hyoplastrals are 75 mm. long at the midline; the hypoplastrals 89 mm., xiphiplastrals 70 mm.

¹ = estimated.

The bridge is 208 mm. wide. The entoplastron is rhombic, 70 mm. long and 75 mm. wide. The posterior lobe of the plastron has a length of 88 mm. and a width at the base of 202 mm. This lobe is deeply notched posteriorly.



Figs. 16 and 17. Carapace and plastron of *Testudo kaiseni*. Type. No. 6352, A. M. N. H. *ent*, entoplastron; *g*, gular scute; *hum*, humeral scute; *hyc*, hyoplastron; *hypo*, hypoplastron; *n 1*, *n 6*, neurals one and six respectively; *nu. p.*, nuchal plate; *xiph*, xiphiplastron. Both figures one-fifth natural size.

The gular scutes have an anterior posterior extent of about 48 mm. and overlap the entoplastron 15 mm., fig. 17. The humerals are 29 mm. wide at the midline, and the humeral-pectoral sulcus crosses well forward on the entoplastron—a very rare occurrence in the genus *Testudo*. The sulcus limiting the pectoral scutes behind is convex backward. The sulci defining the other scutes of the plastron are too obscure to be relied upon.

From *Testudo insolitus* Matthew and Granger, from these same beds, this species may be distinguished by the following contrasted characters:

<i>T. insolitus</i>	<i>T. kaiseni</i>
1. Concave anterior border of carapace	1. Truncated anterior border.
2. Pectoral scute entirely behind entoplastron.	2. Pectoral scute overlapping (strongly) entoplastron.
3. Pectoral scute narrow at center.	3. Pectoral scute wide at center.
4. Anterolateral peripherals not everted.	4. Anterolateral peripherals everted.

The strong overlap of the pectoral scutes on the entoplastron apparently distinguishes this species from the American members of the genus.

***Testudo demissa*, new species**

TYPE.—No. 6670, A. M. N. H., consists of the right xiphiplastral bone. Collected by the Third Asiatic Expedition, 1923.

TYPE LOCALITY.—Ardyn Obo, Chinese Postroad, Outer Mongolia.

HORIZON.—Ardyn Obo formation, Lower Oligocene.

DIAGNOSIS.—Large size; bone heavily thickened; posterior lobe broadly notched behind, thickened and downturned; rounded notch where anal sulcus crosses the free edge; anal scutes relatively short.

A complete right xiphiplastral bone exhibits such striking peculiarities of form and proportion as to indicate an undescribed testudinate turtle. The specific name is in reference to the decurved posterior end of the xiphiplastron (see figure 19), a feature found in the males of the living *T. tabulata*. Furthermore, the free border of the decurved end of the xiphiplastron is bluntly thickened, whereas in most extinct members of the Testudinata that border is acute.

The large size of the individual is indicated by the great breadth of the anterior sutural end which measures 175 mm., or at the hypo-xiphiplastral suture the posterior lobe would be 350 mm. (14 inches) in breadth, being much the largest individual in the entire collection. On the median line the xiphiplastron has a greatest length of 160 mm. The anal scute at the midline is only 50 mm. in length. On the free border where the anal-femoral sulcus crosses the edges, the bone is deeply notched. Anterior to the notch the lateral border is acute, becoming narrowly rounded as it approaches the hypo-xiphiplastral suture; posterior to the notch the border is at first acute as it turns outward but rapidly thickens as it bends downward on the posterior end, reaching a

maximum thickness of 35 mm. This end is broadly but shallowly excavated (see figure 18).

On the upper surface, beginning at the anterior suture, a low wall separates the inner from the outer lateral border; externally the surfaces are regularly sloping to the acute edge of the lobe. This surface is exceptionally wide, measuring 53 mm. at its widest part. On the internal side of the low wall it is at first nearly perpendicular but rapidly slopes inward. This wall of bone stops opposite the notch, and behind it a

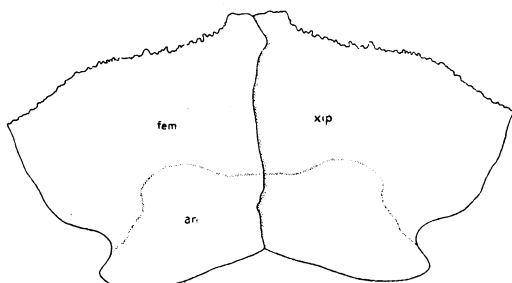


Fig. 18

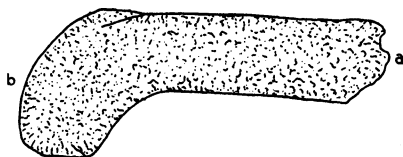


Fig. 19

Fig. 18. Posterior lobe of *Testudo demissa*. Type. No. 6670, A. M. N. H. *an*, anal scute; *fem*, femoral scute; *xip*, xiphiplastron. One-fifth natural size.

Fig. 19. Cross-section of xiphiplastron of *Testudo demissa*, No. 6670, A. M. N. H. *a*, anterior end, *b*, posterior end. About one-third natural size.

shallow grooved channel turns outward, extending to the edge of the bone posterior to the lateral notch. A second wide but shallow channel extends inward to the median line.

The possibility of the xiphiplastron being abnormal in character has been considered, but there is nothing found in the bone itself to indicate abnormality. No trace of a pathologic exostosis that might indicate a diseased condition or a healed fracture is to be observed, the bone appearing normal in every respect. I am therefore of the opinion that the unusual features of this xiphiplastron are typical of this

tortoise, and that they can be relied upon as distinguishing it from all other Mongolian species of the genus.

The meagerness of the known materials precludes discussion of the relationships of *Testudo demissa*, but that it was a large land tortoise pertaining to the Testudinata there can be no doubt. In the shortness of the xiphiplastron, the decided notch at the femoral-anal sulcus, and the broad posterior notching of the lobe, *T. demissa* shows striking similarities to *Testudo ammon* Andrews¹ (see figure 20), from the Eocene of Egypt.

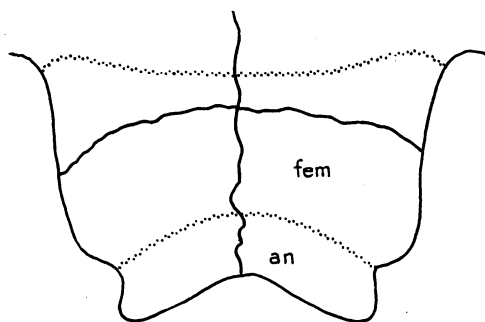


Fig. 20. Posterior lobe of *Testudo ammon* Andrews. *an*, anal scute; *fem*, femoral scute. About one-eighth natural size. After Andrews.

***Testudo nanus*, new species**

Plate VII

TYPE.—No. 6692, A. M. N. H., consists of a complete shell. Collected by Liu in 1928.

TYPE LOCALITY.—East Mesa, Twin Oboes, Shara Murun Region, Inner Mongolia.

HORIZON.—?Ulan Gochu, Lower Oligocene.

DIAGNOSIS.—Small size; shell depressed, quadrangular in outline; surfaces smooth other than costals being crossed by faint longitudinal grooves and ridges; anterior margin shallowly excavated; sulci shallowly impressed; marginal sulcus, coinciding with costo-peripheral suture except perhaps in front where it appears to run below; supracaudal scute divided; front lobe of plastron strongly produced; pecto-humeral sulcus crossing on anterior half of entoplastron; entoplastron subovate, and largely behind the base line of the anterior lobe; gular scutes in front of entoplastron; pectoral scute subequal in length to abdominal; posterior lobe shallowly notched; lobe composed entirely of xiphiplastral bones; movable.

¹1906. "A Descriptive Catalogue of Tertiary Vertebrata of the Fayûm, Egypt," fig. 89.

The type specimen is practically a complete shell and but slightly distorted. A few of the sutures and some of the sulci are obliterated. The protruding epiplastra and concavity of the plastron strongly suggest this individual to be a male.

The carapace is lowly arched in all directions and from above is subquadrangular in outline. At the center it has a length of 163 mm., a greatest width of 150 mm. The anterior border is broadly but shallowly notched. The free edges of the peripherals are everywhere acute. The areas within the vertebrals are smooth. The vertebrals, as is usually the case in this genus, are wider than long. The form of these, as well as other shields of the carapace, are clearly shown in figure 21. Their dimensions are given in the table below.

The supracaudal scute is divided, a condition usually obtaining in *T. græca*. The nuchal scute is small, having a length of 6 mm., a width of 4 mm.

MEASUREMENTS OF VERTEBRALS

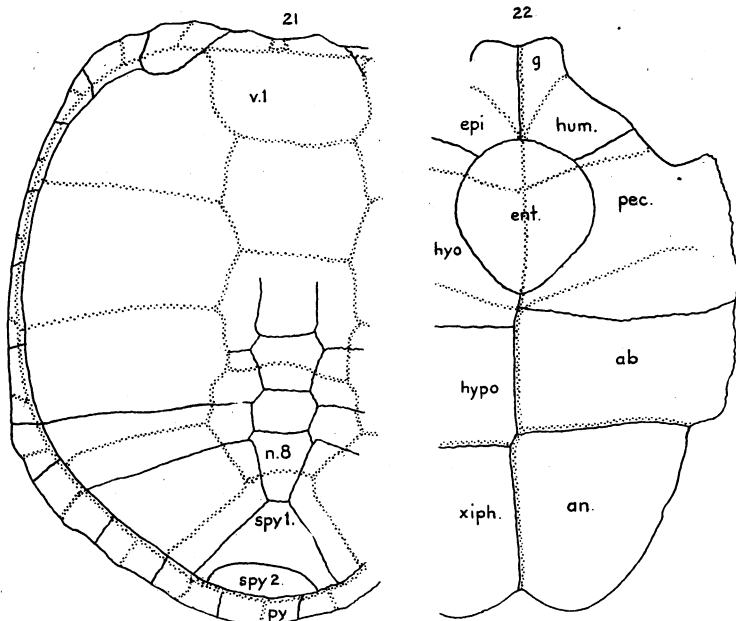
No.	Length	Width
	mm.	mm.
1	32	41
2	29	37
3	28	35
4	29	37
5	42	53

The neurals, so far as they can be traced, are all hexagonal. The costal plates show some differentiation of form, there being alternate wide and narrow plates. The lateral peripherals stand nearly vertical and extend well upward on the side of the carapace. The marginal sulcus and the costo-peripheral suture coincide, except possibly in front when the suture seems to rise above the sulcus, but the evidence is obscure.

The anterior suprapygial is bifurcate, having a total height of about 32 mm. and inclosing the second suprapygial between its right and left limbs. The second suprapygial has a height of 14 mm. and a breadth of 31 mm.

The plastron furnishes the outstanding characters that distinguish this species. Reference is made especially to the short, narrowed anterior lobe with strongly projecting epiplastral lip, the posterior position of the entoplastron, and movable posterior lobe, composed entirely of the xiphiplastral bones.

The epiplastral lip projects prominently forward beyond the general outline of the anterior lobe, as shown in figure 22. The truncated end is notched at the center. The median and gular-humeral sulci run in fairly deep valleys in these bones. Upper and lower surfaces are convex from side to side; free edges obtuse. At the base the lip has a greatest



Figs. 21 and 22. Carapace and plastron of *Testudo nanus*, new species. Type. No. 6692, A. M. N. H. *ab*, abdominal scute; *an*, anal scute; *ent*, entoplastron; *epi*, epiplastron; *g*, gular scute; *hum*, humeral scute; *hypo*, hyoplastron; *hypo*, hyoplastron; *n 8*, eighth neural; *pec*, pectoral scute; *py*, divided pygal scute; *spy 1*, *spy 2*, suprapygals; *v 1*, vertebral one; *xiph*, xiphoplastron. About one-half natural size.

width of 26 mm.; it extends 16 mm. beyond the line joining the gular-humeral sulci, and has a greatest thickness of 16 mm. The plastron has a greatest length on the median line of 150 mm. The anterior lobe is 77 mm. wide at the base and 23 mm. long. The posterior lobe is 97 mm. wide at the base and about 42 mm. long at the center. The posterior end is shallowly notched. The bridge is 70 mm. wide. The entoplastron is subovate in shape, and peculiar from the fact that much the greater portion of this bone lies posterior to the line forming the base of the

anterior lobe. The opposite condition prevails in all other species of *Testudo* coming under my observation. The entoplastron is relatively large, measuring 40 mm. long and 37 mm. wide.

The hyoplastral bones join at the midline for a distance of 8 mm., the hypoplastrals for 33 mm., and the xiphiplastrals for 40 mm.

The gular scutes taken together are 26 mm. wide. They do not overlap the entoplastron, a feature that also seems peculiar to this species. The humerals have an extent of 16 mm. along the midline and overlap the forward end of the entoplastron to about the extent that the gulars usually cover it in most species of *Testudo*. The pectorals meet for 29 mm. on the midline; the abdominals for 35 mm. The extent of the femoral and anal scutes cannot be determined. The abdominal-femoral sulcus apparently coincides with the xiphiplastral-hyoplastral suture. The position of this suture on the basal line of the posterior lobe distinguishes this species from all others of the genus, with the exception of the living *Testudo ibera*, *T. græca* and *T. marginata*. All three of these species are said by Boulenger¹ to have a movable posterior lobe. In *T. nanus* the posterior lobe is slightly dislocated along this suture; the shelf-like edge is toothed quite unlike the usual interdigitating suture, and the character of these serrations appears to bear out the idea that this lobe in life was movable as in the living species mentioned above.

T. nanus, with its movable posterior lobe and short plastral lobes, ovate entoplastron and similarity in extent and arrangement of the plastral scutes, might very well represent the ancestral group from which *T. græca* and *T. ibera* have been derived. The occurrence of the extinct species in the lower Oligocene is sufficiently ancient to fully account for the wide geographical distribution of the related species over the area they now occupy in southeastern Asia, southern Europe and north-western Africa.

This movable posterior lobe, with its attendant modification of the plastral bones, is an important structural modification, and it at once raises the question of the propriety of continuing to include those species having a fixed lobe in the same genus. While not disposed to go into this matter further, I wish to call attention to the fact that *T. græca* is the genotype of the genus *Testudo*,² and in the event of such a division being made, *Testudo* would stand for the small group of species having a movable lobe, whereas the others would require other generic designation.

¹1889. "Catalogue of Chelonians, Rhynchocephalians and Crocodilia in the British Museum," pp. 174-177.

²Linnaeus, 1758. *Systema Naturæ*, 10th Ed., Vol. 1, p. 197.

***Testudo ulanensis*, new species**

Plate VIII, Figs. 2 and 3

TYPE.—No. 6691, A. M. N. H., consists of a nearly perfect posterior plastral lobe to which is attached a portion of the left bridge and a narrow median part of the plastron that extends as far forward as the entoplastral region; one complete costal; articulated peripherals, nine, ten and eleven of both sides, those of the left side having parts of the sixth, seventh and eighth costals attached. Collected by Albert Thomson, 1928.

TYPE LOCALITY.—North Mesa, Shara Murun region, Inner Mongolia:

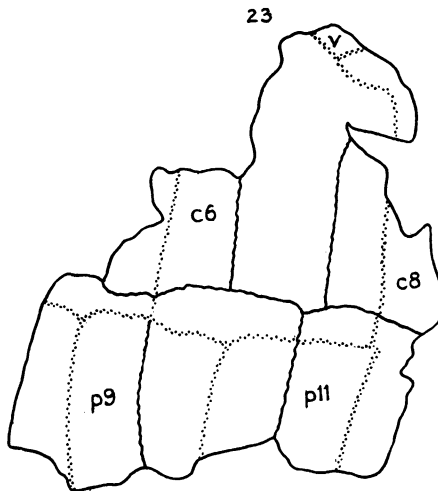


Fig. 23. Left posterior part of carapace of *Testudo ulanensis*. Type. No. 6691, A.M.N.H. *per 9*, *per 11*, peripherals nine and eleven respectively; *c 6*, *c 8*, costals six and eight; *v*, vertebral scute. About one-fourth natural size.

HORIZON.—Ulan Shireh, Upper Eocene.

DIAGNOSIS.—Large size; shell highly arched; carapace apparently declivous behind; bone of moderate thickness; surface heavily undulating; sulci plainly impressed; marginal sulcus running well below costo-peripheral suture; pectoral-humeral sulcus crossing behind entoplastron; pectoral scute slightly less than one-third the length of the abdominal scute; hind lobe broadly notched behind; edges acute; lateral borders abruptly notched where anal sulcus crosses free border.

The fragmentary type specimen can be distinguished from the other Mongolian species of this genus, but further materials are needed before the species can be satisfactorily characterized. Its unique geographical

and geological occurrence, however, appears to justify its description at this time.

Testudo ulanensis may at once be distinguished from all other known Mongolian members of the genus *Testudo* by the fact that the marginal

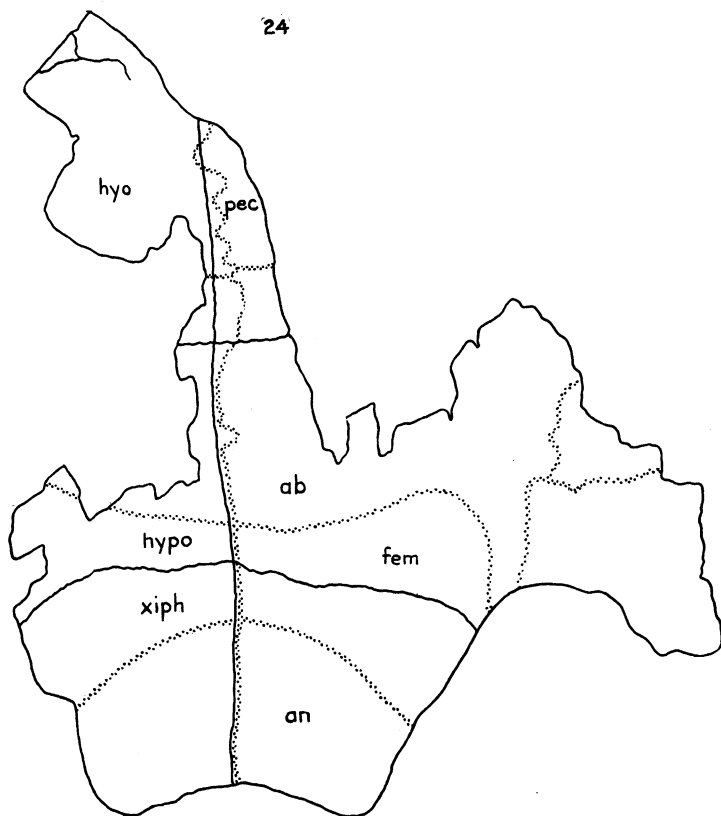


Fig. 24. Plastron of *Testudo ulanensis*. Type. No. 6691, A. M. N. H. *ab*, abdominal scute; *an*, anal scute; *fem*, femoral scute; *hyo*, hyoplastron; *hypo*, hypoplastron; *pec*, pectoral scute; *xiph*, xiphiplastron. About one-fourth natural size.

sulcus crosses the peripherals well below the costal-peripheral suture (see figure 23). The type specimen is a large male, in size nearly equaling *T. insolitus* from the Ardyn Obo.

The posterior peripherals have an acute free edge that is more or less scalloped, the indentations being most pronounced at the sutural

junction of the bones. None of the peripherals preserved is everted. The ninth is 107 mm. high, the eleventh 86 mm.

The fourth costal has a length of 230 mm., a width at the distal end of 85 mm., the proximal end 60 mm.; the seventh, a length of about 150 mm., a width at the distal end of 47 mm.

The form of the plastron is well shown in figure 24. The posterior end is broadly but shallowly notched, its width being 110 mm., its depth only 21 mm. The anal region is distinctly marked off by abrupt notching of the lateral borders where the anal sulcus crosses the edge. The borders in front of this notch are acutely edged, as are the apices of the xiphiplastra. At the inguinal notch the border of the posterior lobe presents a wall that overhangs the outer face of the lobe and continues backward nearly to the lateral notch. More posteriorly, the outer face slopes away to the edge, whereas the inner face becomes more or less perpendicular. The wall turns inward at the posterior end but entirely subsides before reaching the median line.

At the middle, the posterior lobe has a length of 106 mm. and a width across the base of 244 mm. The xiphiplastrals have a greatest length of 117 mm., the hyoplastra 105 mm. The anal scutes are 86 mm. long, the femoral 50 mm., the abdominal 140 mm., the pectoral 50 mm.

In the relative length and outline of the posterior lobe, this species has its nearest resemblance in *T. impensa* Hay from the Miocene of Montana. It is distinguished, however, by a difference in extent of the plastral scutes and by having the marginal sulcus running below the costo-peripheral suture.

***Testudo kalganensis*, new species**

Plate IX

TYPE.—No. 6701, A. M. N. H., consists of the median part of the anterior end of a carapace with attached costals and peripherals; a median section of the left side of the shell; articulated fifth, sixth, seventh and eighth costals with attached peripherals, and a small portion of the right hypoplastron; second, third and fourth left costals with parts of neurals three and four of left side; anterior portion of the plastron and several detached fragmental parts of both carapace and plastron. Collected by G. B. Barbour.

TYPE LOCALITY.—Kalgan area, North China.

HORIZON.—Tertiary?

DIAGNOSIS.—Medium size; shell strongly arched, thick, surfaces roughened by swollen areas and heavy ridgings; sulci running in deep valleys; anterior margin of carapace shallowly concave; front lobe of plastron massively and strongly produced; surfaces of epiplastra produced below level of adjacent bones; pecto-humeral sulcus crossing rear of entoplastron; entoplastron seven-sided; gular scutes overlapping entoplastron.

The history of the specimen selected as the type of the present species is given in a letter from Mr. Walter Granger, under date of January 18, 1930:

"You will find in this new lot of specimens one rather extraordinary tortoise with a highly sculptured shell. It was sent down to us from Columbia last summer by Dr. Barbour of Yenching University, Peking, and was associated with some fragments of small dinosaurs from Barbour's "Nantienmen" Cretaceous beds of the Kalgan area, North China.

Presumably the turtle was found in the same beds as the dinosaurs, but the bone has a decidedly different style of preservation from the dinosaurs and furthermore, there was a fragment of a mammalian ulna mixed with the lot."

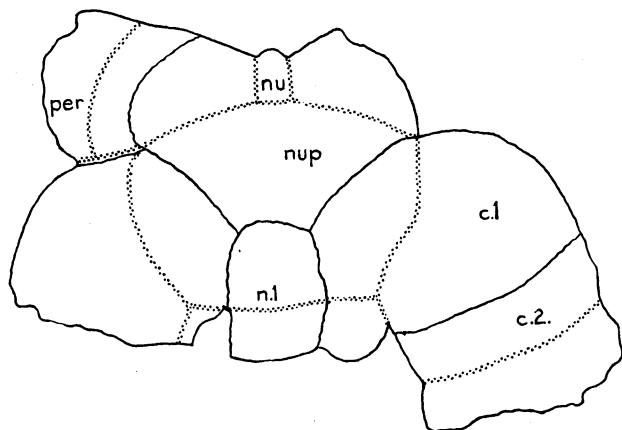


Fig. 25. Front of carapace *Testudo kalganensis*. Type. No. 6701, A. M. N. H. *c 1*, *c 2*, costals one and two; *n 1*, first neural; *nu*, nuchal scute; *nu p*, nuchal plate; *per*, peripheral one. About one-half natural size.

The fact that this specimen pertains to the genus *Testudo* gives additional reason for believing there was a mixture of fossils of two different ages, for nowhere has *Testudo* been found in deposits more ancient than Eocene Tertiary, and for the present I shall designate its occurrence as being from the Tertiary.

Upon assembling the parts of the type specimen in their normal relationship, a few fragmentary bones of a second individual were detected. These were practically the same size and in every way closely resemble the homologous parts of the type, so that if any error has been made in the proper association of the bones of these two individuals it should in no way affect the conclusions reached.

Although no direct contacts now exist between the three main preserved sections of the carapace (see Plate IX), when placed in their relative relationships an approximation of the principal proportions of the shell is obtained, and the specimen is shown to be a tortoise of moderate size having an estimated length of about 275 mm.

The anterior part of the carapace consists of the entire nuchal, first neural, first costal of both right and left sides, portion of the second costal of the right side and the first peripheral of the left side (see figure 25). The shell is concave in front with a narrow median notch. The free edge is obtuse and the bone proceeding inward thickens rapidly both above and below this edge. The nuchal is 34 mm. wide on the free borders; its greatest width 72 mm., greatest thickness on midline 21 mm., at suture with first peripheral 25 mm. The first peripheral is 36 mm. wide on the free border and 35 mm. long at the suture for the second peripheral, and measures 27 mm. in thickness. The first neural is sub-rectangular in shape and has a greatest length of 33 mm., and a greatest width of 23 mm., the third neural quadrangular 22 mm. long and 29 mm. wide; fourth octagonal, 23 mm. long and 58 wide.

The costals are alternately wide and narrow at their ends. The lateral peripherals stand nearly perpendicular. The seventh, which is articulated with a portion of the plastron, has a height of 64 mm. The marginal sulcus on this peripheral traverses it diagonally from the posterior sutural border of the upper end to the center of the bone at the distal end (see figure 26). The free borders of peripherals eight, nine, and ten are obtusely edged. These bones are swollen outward along the line of their sutural junctions. The ninth peripheral has a greatest thickness of 25 mm.

The sulci crossing these bones everywhere traverse deep valleys; the surfaces of nearly all of the bones are swollen, and the costals are further ornamented by a series of heavy ridges and deep intervening grooves that cross their lower halves at right angles to their greatest length. This sculpturing is interrupted at intervals by the deep valleys carrying the sulci. Irregularly shaped depressions add further to the general roughness of the external surface. Within the posterior area of the first vertebral, a heavy obtuse median ridge is developed that extends backward on to the anterior half of the first neural; it subsides, however, before reaching the transverse sulcus. The first vertebral is wider than long, having a greatest transverse diameter of 70 mm., and a length of 60 mm. The nuchal scute is narrow, being only 7 mm. wide and 11 mm. long, and stands up as a rounded node-like protuberance that extends forward free from the rim in the median notch.

The anterior portion of the plastron consists of the complete epi-plastrals, and almost the entire left hyoplastron. The entoplastron is missing, but its shape and principal dimensions can be determined as shown in figure 27. The massive proportions of the anterior lip, which projects boldly forward from the general contour of the lobe, is one of the outstanding peculiarities of this species. Within the gular area, the ventral surface of the lip projects downward well below the adjacent

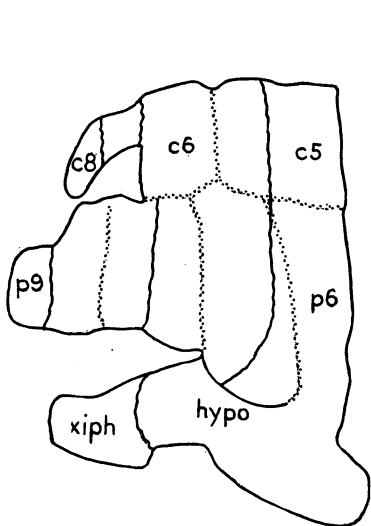


Fig. 26

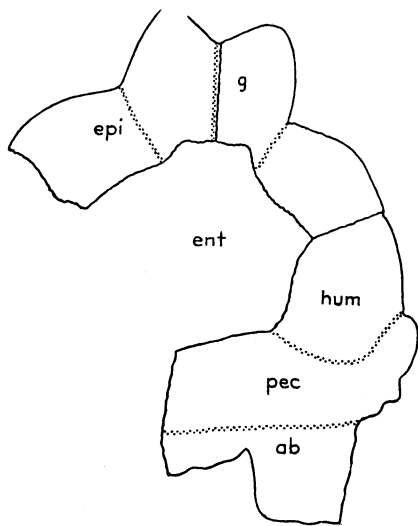


Fig. 27

Fig. 26. Right posterior side of carapace of *Testudo kalganensis*. Type. No. 6701, A. M. N. H. *c 5, c 6, c 8*, costals five, six and eight; *hypo*, hypoplastron; *p 6, p 9*, peripherals six and nine respectively; *xiph*, xiphiplastron. About one-half natural size.

Fig. 27. Front lobe of plastron *Testudo kalganensis*. Type. No. 6701, A. M. N. H. *ab*, abdominal scute; *ent*, space occupied by entoplastron; *epi*, epiplastron; *g*, gular scute; *hum*, humeral scute; *pec*, pectoral scute. About one-half natural size.

surface of the lobe. This feature, so far as I can find, is peculiar to *T. kalganensis*. In all other members of the genus the lip forms practically a plane surface on the under side with the rest of the anterior lobe. A deep longitudinal groove on the median line divides the ventral surface of the lip into two halves which are angularly notched on the anterior border; the upper surface is somewhat convex from side to side but at the center is traversed by a shallow longitudinal groove that ends in the notch in the front of the lip. It is deeply excavated posteriorly. The lip has a greatest width of 46 mm., and a greatest depth of 41 mm., at

the point where the gular-humeral sulci cross the free borders of the epi-plastra, which project 24 mm. beyond the free border of the lobe.

The entoplastron has a greatest transverse diameter of 64 mm., a greatest antero-posterior diameter of 54 mm. It was overlapped by the gular scute and crossed by the humeral-pectoral sulcus. These sulci, as on the carapace, are deeply impressed, and the ventral surface of the plastron is irregularly swollen and uneven.

The anterior lobe has a length of about 77 mm., a width at the base of about 120 mm. The hyoplastra meet on the midline for a distance of about 45 mm.

The portions of the hypoplastron and xiphiplastron which are attached to the seventh peripheral show the inguinal opening to be much restricted in size (see Plate IX, figure 5), as in the living *T. tabulata*. At the inguinal notch the posterior lobe presents a perpendicular wall that is 30 mm. in height. The upper border of this wall is bluntly edged. As it passes backward onto the xiphiplastron, it recedes rapidly in height, and the outer and inner faces slope either way. Inguinal buttress just reaches the costal plates.

***Testudo* sp. indet.**

(1) A turtle specimen, No. 6601, A. M. N. H., consisting of the complete left hind leg and foot with dermal armor, and associated with fragmental parts of the carapace and plastron, was collected in the Shara Murun formation, Upper Eocene, on the Chinese Postroad, Ula Usu, Inner Mongolia, by Peter Kaisen, in 1923. Resemblance of the armor to certain American species¹ of *Testudo*, leads me to refer the specimen to that genus. If correct in this reference, it is the most ancient *Testudo* yet found in Asia, being rivaled only by *T. ammon* Andrews from the Eocene of Egypt. The unusually perfect preservation of the dermal armor of the leg makes this specimen of no little interest.

In Fig. 28 the shape and arrangement of the separate bones forming the armor are clearly depicted. It will be noted that the nodules of bone increase in size from above downward and that the lower pointed end of each scute overlaps the next one below, shinglewise. On either side of this central area the scutes become smaller, whereas on the posterior side of the lower leg many of the scutes are ankylosed, tending to form a narrow but continuous longitudinal sheath of bone. The sole of the foot was also covered with these bony scutes. They differ from those of *T.*

¹Hay, O. P. 1908. "Fossil Turtles of North America," pp. 427, 445 and 446.

*orthopygia*¹ (Cope) in lacking the great number of small ossicles close to the toes. Externally all of these bony nodules have flattened or gently convex surfaces, but their internal sides are angularly but strongly convex. On the posterior side of the leg, however, the anchylosed scutes are flattened on both outer and inner surfaces, more especially the inner.

One small lot of foot and dermal bones collected in 1925 from this same locality and a right epiplastral bone, No. 6603, A. M. N. H.,

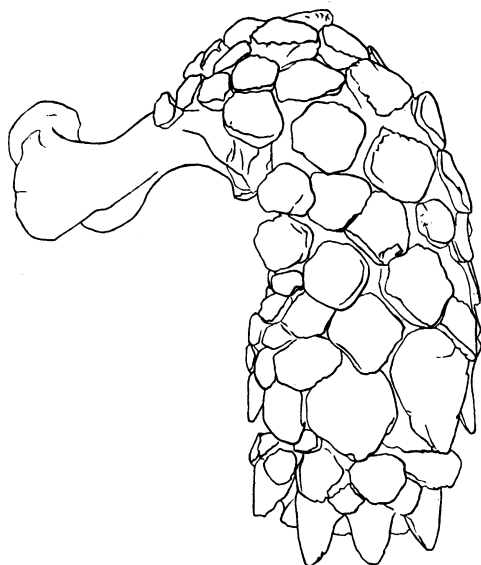


Fig. 28. Hind limb and foot with dermal armor of *Testudo* sp. No. 6601, A. M. N. H. Viewed from the front. About one-half natural size.

collected in 1923, both referable to *Testudo*, give additional evidence of the presence of this genus in the Shara Murun formation.

(2) Numerous fragmentary parts of an armored turtle leg, associated with pieces of carapace and plastron, show the presence in the Ulan Gochu formation, Lower Oligocene, of a large testudinate tortoise, probably referable to the genus *Testudo*. The armor of the knee and lower leg, made up of five- and six-sided bony scutes that fit together in a mosaic-like pattern, appears to differ from the overlapping scutes of No.

¹Idem, Fig. 599, p. 445.

6601, A. M. N. H., from the Shara Murun. This specimen was collected at Jhama Obo, East Mesa, Shara Murun region, in 1928.

(3) A Testudinate skull, No. 6695, A. M. N. H., in the collection from the same locality, may possibly pertain to this same form. The crushing surfaces of the jaws having longitudinal ridges and grooves, combined with the similarity, shape and proportions, leads me to refer this specimen to the genus *Testudo*, Otherwise its state of preservation is such that its detailed structure is largely obscure.

(4) A plastral fragment, No. 6358, A. M. N. H., shows the presence of an exceedingly large *Testudo* in the Irdin Manha beds. This specimen was collected 25 miles east of Iren Dabasu, Mongolia, by the Central Asiatic Expedition in 1923. This specimen is of interest as recording the most ancient occurrence of *Testudo* yet found in Mongolia.

Family **TRIONYCHIDÆ**

Trionyx sculptus, new species

Plate X

TYPE.—No. 6700, A. M. N. H., consists of the greater portion of the carapace but lacks the nuchal, preneural and distal ends of many of the costals. Collected by the Central Asiatic Expedition in 1928.

TYPE LOCALITY.—Tairum Nor Basin, Inner Mongolia.

HORIZON.—Tung Gur, Pliocene.

DIAGNOSIS.—Large size; carapace broader than long; seven neurals, the seventh reduced; hollowed out longitudinal depression along middle of back; broad, smooth band along outer ends of costals; sculpture consisting of pits and ridges, pits usually angular in shape, ridges usually abrupt.

The specimen to which the name *Trionyx sculptus* has been given is a large individual, having an estimated length of not less than 535 mm., a greatest width at the center of 600 mm., Plate X. Although much of the rim of the carapace is wanting, the impressions of the missing portions are shown in the slab of rock to which the carapace still remains attached.

The nuchal and preneural are missing, so that the form of the anterior border can not be determined, but that a preneural bone was present is indicated by the impressions left in the underlying rock. There are seven neurals, and, excepting the seventh, the others are of the usual coffin shape. The last is subovate in outline. It contributes to only about a fourth of the separation of the seventh costals. All of the costals grow broader toward their outer ends. Those of the seventh pair are united on the midline by the greater part of their width, and the

eighth pair entirely. The suture separating the seventh and eighth costals of the left side has so fully coalesced that it can no longer be detected. The free ends of costal four, five, and a small part of the sixth and the eighth of the left side are preserved; and portions of the fourth, fifth, sixth and eighth on the right side. At their free ends the median costals are beveled off from above to a sharp edge, except where the rib projects beyond the costal plate. This beveled portion is free from sculpture and on the fourth costal forms a band that is 45 mm. wide. Posteriorly the edge is obtuse and the sculpturing extends to the edge. None of the projecting ribs is completely preserved, so it cannot be determined how far they project beyond the costal plate.

The sculpture consists of angularly rounded pits with intervening ridges, the pits being deeply impressed and the ridges usually abrupt. The pits are irregular in size and grouping but have a tendency to arrange themselves in transverse rows. Where coarsest along the middle of the costals, there are two pits in a line, 10 mm. long; toward their outer ends three pits in 10 mm., and at their proximal ends as many as four. They are large and distinct in the median depression on the back and on the middle of the costals; smaller on the highest part of the carapace and on the outer ends of the costals. The character of the sculpturing is shown in Plate X, fig. 1.

A second specimen, No. 6705, A. M. N. H., referable to this same species, is represented by the distal half of a costal plate, which was collected from the same formation as the type at Gur Tung Khara Usu, Inner Mongolia.

***Amyda? johnsoni*, new species**

Plate XI

TYPE.—No. 6357, A. M. N. H., consists of about two-thirds of a carapace. Collected by A. F. Johnson, 1923.

TYPE LOCALITY.—Telegraph Line Camp, Irdin Manha, Inner Mongolia.

HORIZON.—Irdin Manha, Upper Eocene.

DIAGNOSIS.—Carapace nearly as broad as long, truncated posteriorly; seven neurals, seventh reduced; sixth costal with much expanded distal extremity; sculpture consisting of shallow sub-rounded pits, irregular in size and grouping; intervening rounded ridges narrower than pits; narrow band along lateral border devoid of sculpture.

The nuchal is entirely missing, as is the anterior half of the first neural, and it is, therefore, impossible from this specimen to definitely determine its generic affinities. Provisionally I shall refer it to the genus *Amyda*.

It is estimated that the complete carapace had a length of about 400 mm., and a greatest width of 390 mm. The sides of the carapace are slightly scalloped, and, although all of the rib ends are missing, it would seem that they must have projected beyond the ends of their respective costal bones.

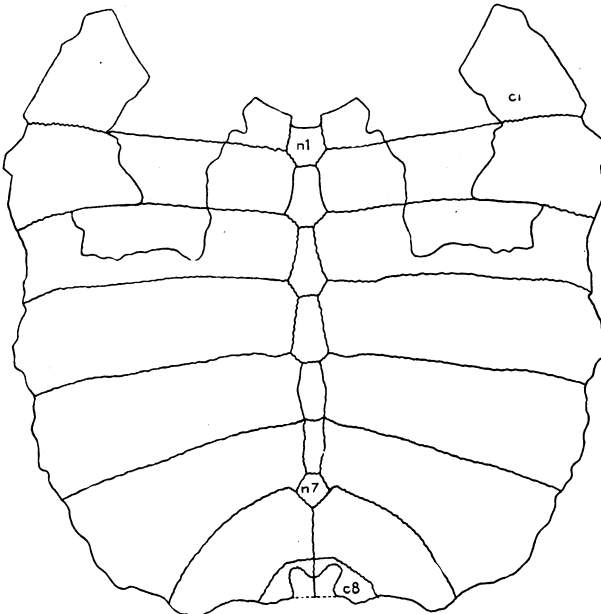


Fig. 29. Carapace of *Amyda? johnsoni*. No. 6357, A. M. N. H. Type. Restored. *c 1*, *c 8*, costals one and eight; *n 1*, *n 7*, neurals one and seven respectively. About one-fifth natural size.

There are eight pairs of costal plates and seven neurals. In general the neurals are rather narrow. The anterior four are coffin-shaped with the narrow ends directed forward; the next one subquadrangular, being widest at the center; the sixth has the narrow end behind, while the seventh is cordate and much reduced in size. Their dimensions are given in the following table.

No.	Length	Width
	mm.	mm.
1	..	31
2	44	24
3	50	23
4	45	22
5	37	18
6	34	13
7	21	21

All the costal bones, except the seventh and eighth, have wider distal than proximal ends; the sixth is especially notable in this respect. The last two pairs of costals meet on the midline.

The form and relative proportions of the costal plates may be seen in figure 29.

In general the sculpture of the carapace is coarse (Plate XI, fig. 2), there being about three pits in a line 10 mm. long. The pits are irregular in size, shape, and grouping. They are relatively shallow, and the rounded walls surrounding them are usually narrower than the pits. On the distal fourth of the median costal plates, the pits become smaller and less well defined. A narrow band devoid of ornamentation extends along the sloping lateral borders. On the posterior end, however, the sculpturing continues out to the edge of the carapace. The median part of the carapace has a wide shallow longitudinal depression running from end to end.

A second specimen, No. 6359, A. M. N. H., from the same locality as the type and consisting of many carapace fragments, is tentatively referred to this species.

TRIONYCHIDS, indet.

Under this heading, comments are made on a considerable number of fragmentary specimens, none of which is worthy of scientific designation. It is more than probable that several of these specimens represent undescribed species, but since the parts preserved are not diagnostic there seems to be no point in attempting to name them. However, they show the presence of trionychid turtles in several formations and from widely separated localities, and are thus worthy of record.

These specimens are discussed in the order of their geological sequence, beginning with the most ancient. The specimen bearing

No. 6711, A. M. N. H., consists of a few fragments of the carapace, was collected from the On Gong formation, Lower Cretaceous, $107^{\circ} 40''$ east longitude, $41^{\circ} 30''$ north latitude, Mongolia. This is the most ancient trionychid turtle yet found in Mongolia. In this connection it is of interest to call attention to the fact that in America representatives of this family are not known below the Upper Cretaceous.

No. 6557, A. M. N. H., a portion of a hyoplastron from the Iren Dabasu formation, Lower Cretaceous, Iren Dabasu Basin, Inner Mongolia. Three other lots, bearing Nos. 6362 and 6363, A. M. N. H., and two lots without designation, all from this same field and formation, show the presence of three if not four species of trionychid turtles.

No. 6360, A. M. N. H., from the Irдин Manha formation, Upper Eocene, found in the vicinity of Telegraph Line Camp, Irдин Manha, Inner Mongolia. In this lot there are parts of several different kinds of sculptured fragments, all pertaining to the Trionychidæ. These fragmentary specimens give a hint as to the great variety of turtle life that abounded in this region in Upper Eocene times. Some of the fragments are ornately sculptured.

The occurrence of trionychid turtles in the Shara Murun formation is indicated in the collection by the distal end of a costal plate collected at Ula Usu in 1923.

No. 6713, A. M. N. H., from the Ulan Shireh formation, Upper Eocene, Chimney Butte (not from Quarry), North Mesa, Shara Murun region, Inner Mongolia. Two carapace fragments. No. 6714, A. M. N. H., from the Chimney Butte Quarry; rest of history same as above. Consists of two complete costal bones. Two, if not three, species are represented in these lots.

No. 6667, A. M. N. H., from the Ulan Shireh formation, Upper Eocene, North Mesa, Mongolia, consists of carapace and plastron fragments.

One lot, No. 6354, A. M. N. H., without field designation or locality, is recorded from the Ardyn Obo formation; collected in 1923. A few costal fragments furnish the only record of the occurrence of trionychid turtles in this formation.

PLATES I to XI

PLATE I

Anosteira mongoliensis, parts of carapace and plastron: Type. No: 6666, A. M. N. H.

Fig. 1. Nuchal bone.

Fig. 2. Distal end of a costal plate.

Fig. 3. Posterior peripheral.

Fig. 4. First peripheral.

Fig. 5. Plastron with attached peripherals. Paratype. No: 6697, A. M. N. H.

Fig. 6. Nuchal of emydid turtle, No. 6605, A. M. N. H. All figures about natural size.

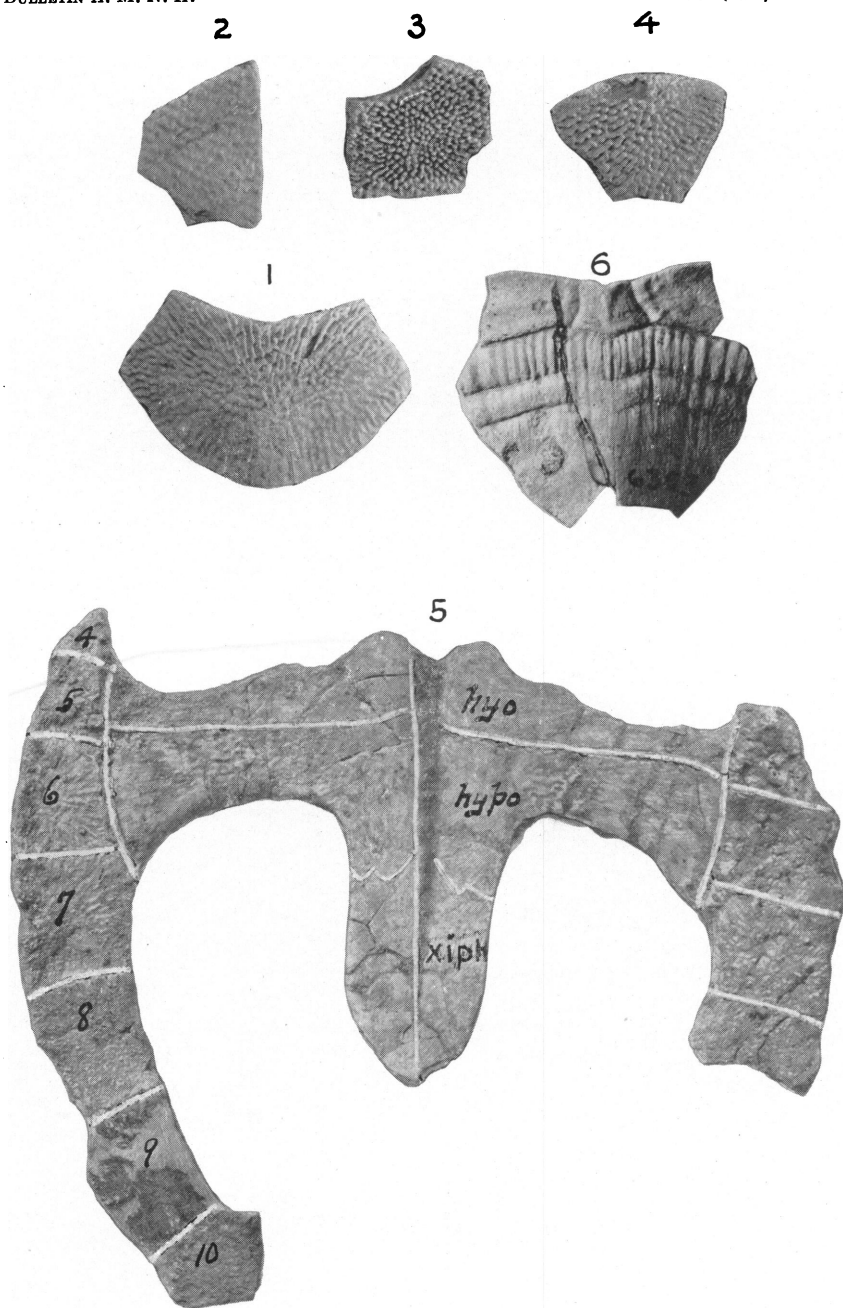


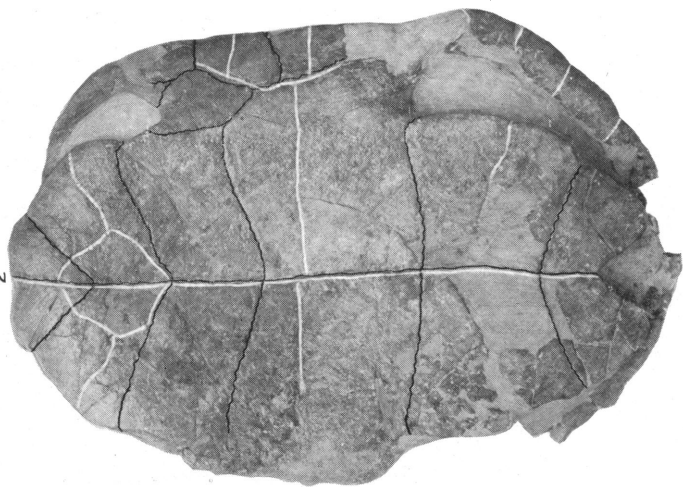
PLATE II

Palæochelys? elongata. Carapace and plastron. Type. No. 6698, A. M. N. H.

Fig. 1. Carapace. $\times 2.7$.

Fig. 2. Plastron. $\times 2.7$.

2



1

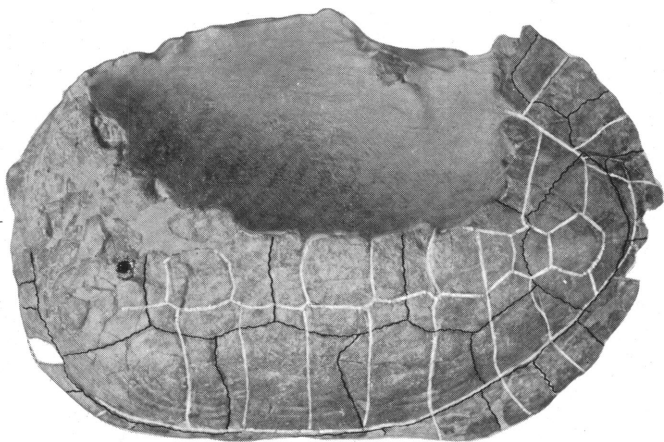


PLATE III

Ocadia? perplexa, carapace and plastron. Type: No. 6699, A. M. N. H.

Fig. 1. Carapace. $\times 1.5$.

Fig. 2. Plastron. $\times 1.5$.

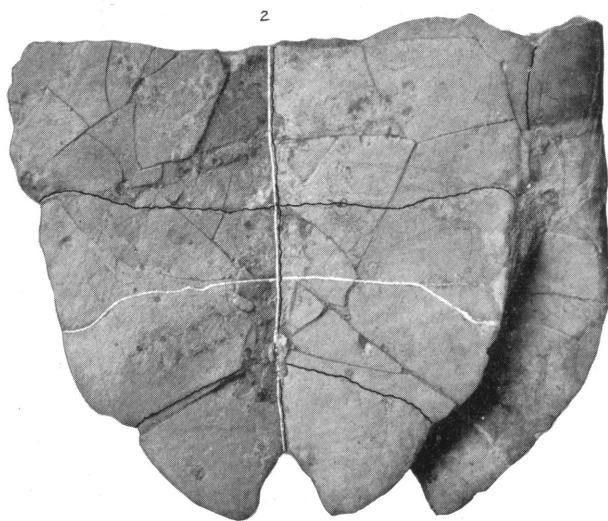
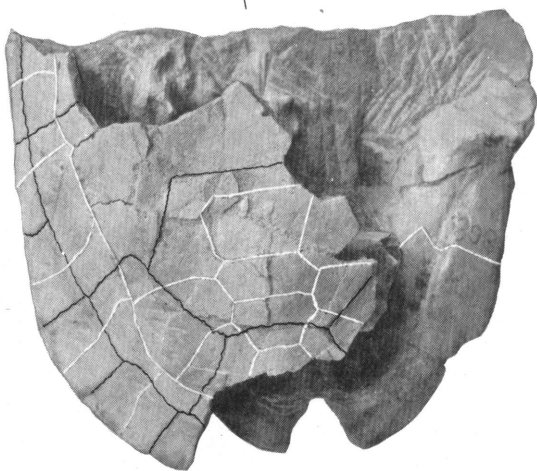


PLATE IV

Sharemys hemispherica, carapace and plastron. Type. No. 6694, A. M. N. H.

Fig. 1. Carapace. $\times 2$.

Fig. 2. Plastron. $\times 2$.

1



2

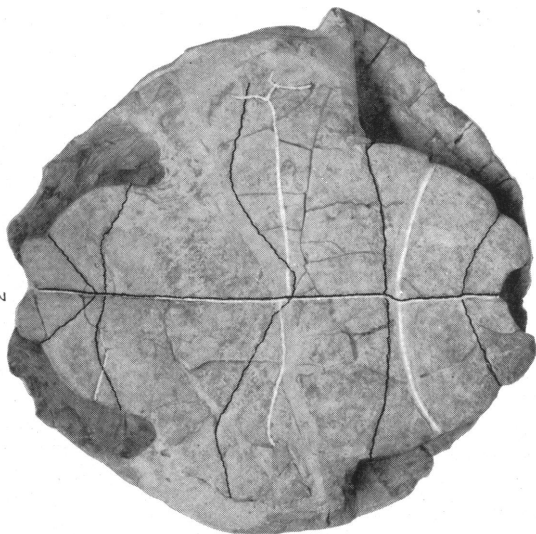


PLATE V

Testudo insolitus, plastra.

Fig. 1. Anterior half of plastron. No. 6351, A. M. N. H. $\times 3$.

Fig. 2. Left half of plastron. No. 6350, A. M. N. H. $\times 3.7$.

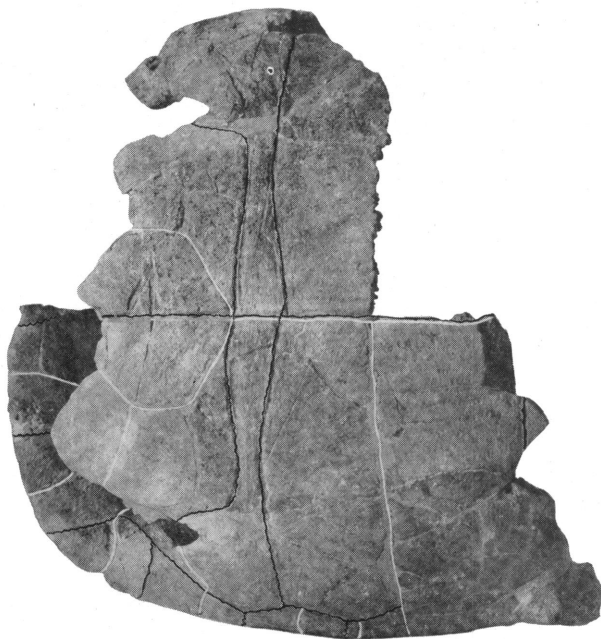


PLATE VI

Testudo kaiseni, carapace and plastron. Type. No. 6352, A. M. N. H.

Fig. 1. Carapace. $\times 4.5$

Fig. 2. Plastron. $\times 4.5$.

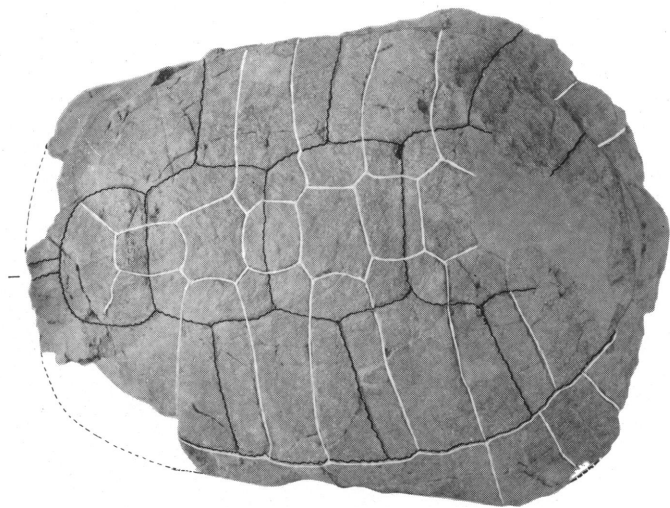
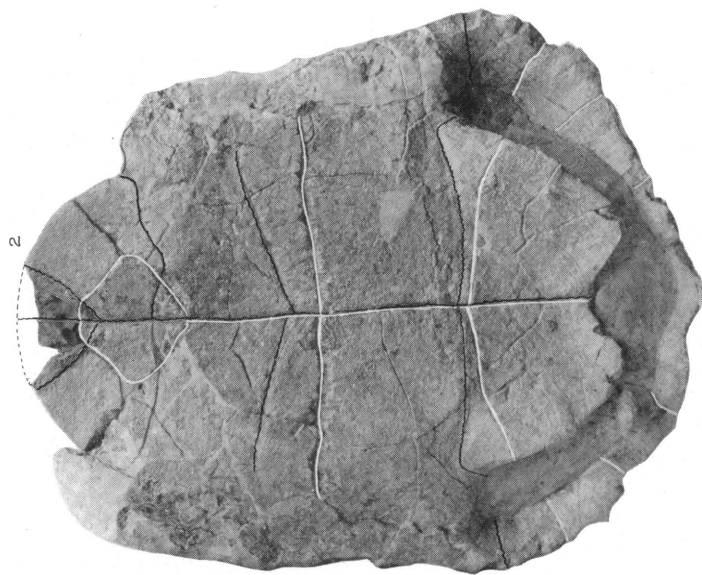


PLATE VII

Testudo nanus, carapace and plastron. Type. No. 6692, A. M. N. H.

Fig. 1. Carapace. $\times 2.2$.

Fig. 2. Plastron. $\times 2.2$.

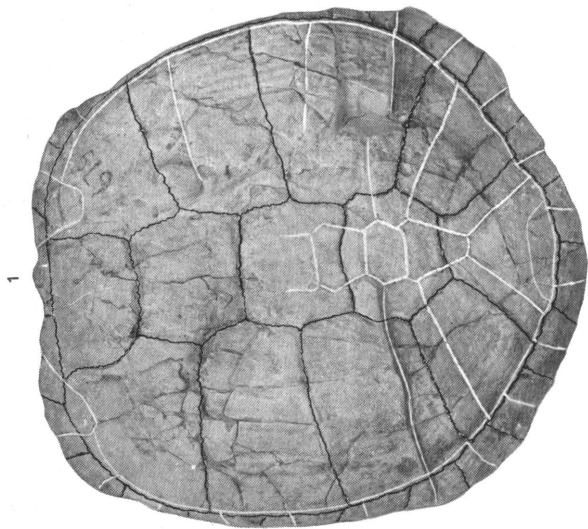
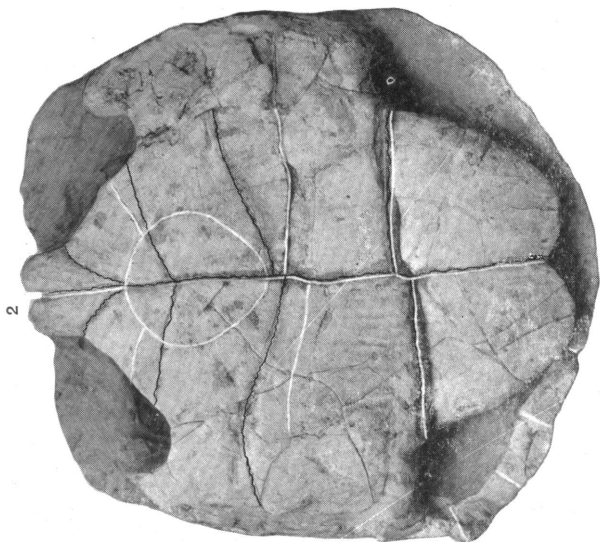


PLATE VIII

- Fig. 1. *Testudo insolitus*, front portion of carapace. No. 6353, A. M. N. H. $\times 3.1$.
- Fig. 2. *Testudo ulanensis*, plastron. Type. No. 6691, A. M. N. H. $\times 5$.
- Fig. 3. *Testudo ulanensis*, peripherals nine, ten and eleven. Type. No. 6691, A. M. N. H. $\times 5$.

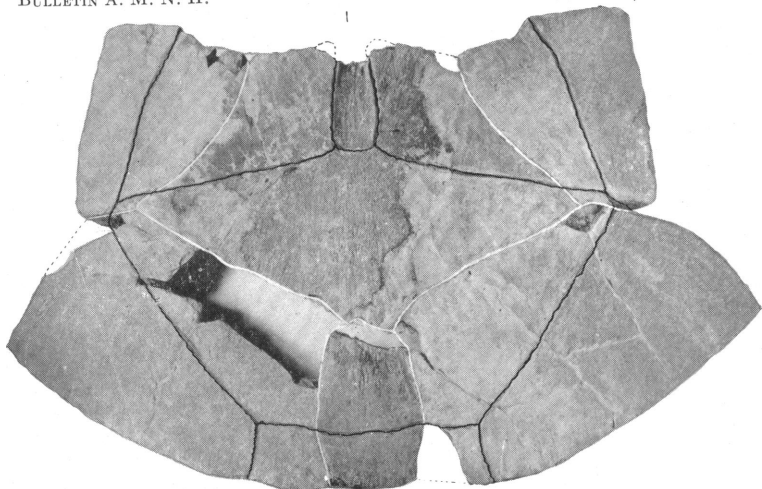
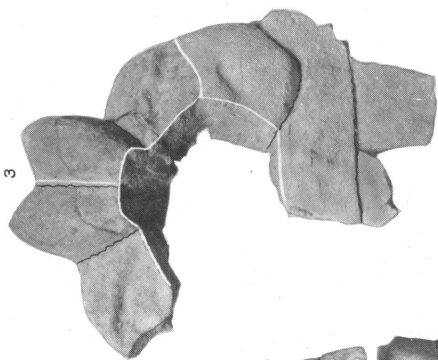


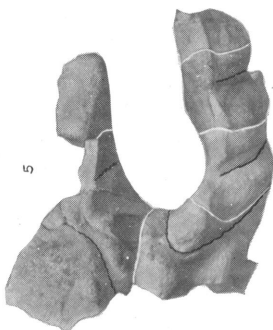
PLATE IX

- Testudo kalganensis*, portions of carapace and plastron. Type. No: 6701
A. M. N. H.
- Fig. 1. Anterior portion of carapace. $\times 3.9$.
 - Fig. 2. Costals five, six, seven and eight (right). $\times 2.9$.
 - Fig. 3. Anterior portion of plastron. $\times 3.9$.
 - Fig. 4. Costals three and four (left). $\times 2.9$.
 - Fig. 5. Inguinal notch, ventral view. $\times 2.3$.

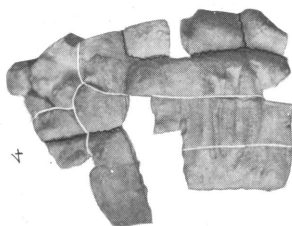
3



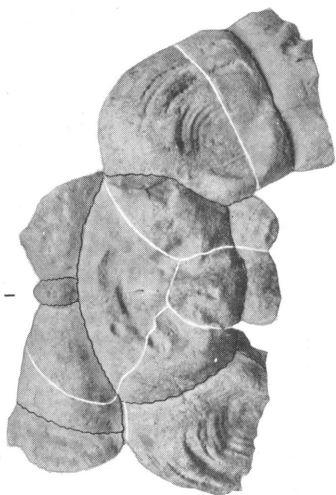
5



4



1



2

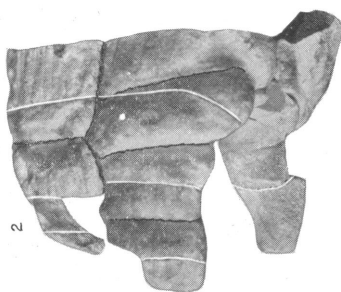


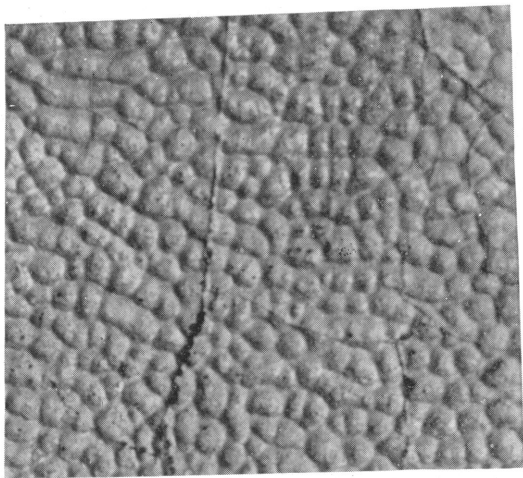
PLATE X

Trionyx sculptus, carapace. Type. No. 6700, A. M. N. H.

Fig. 1. Carapace. $\times 6$.

Fig. 2. Part of fourth costal showing character of sculpture. $\times 1$.

1



2

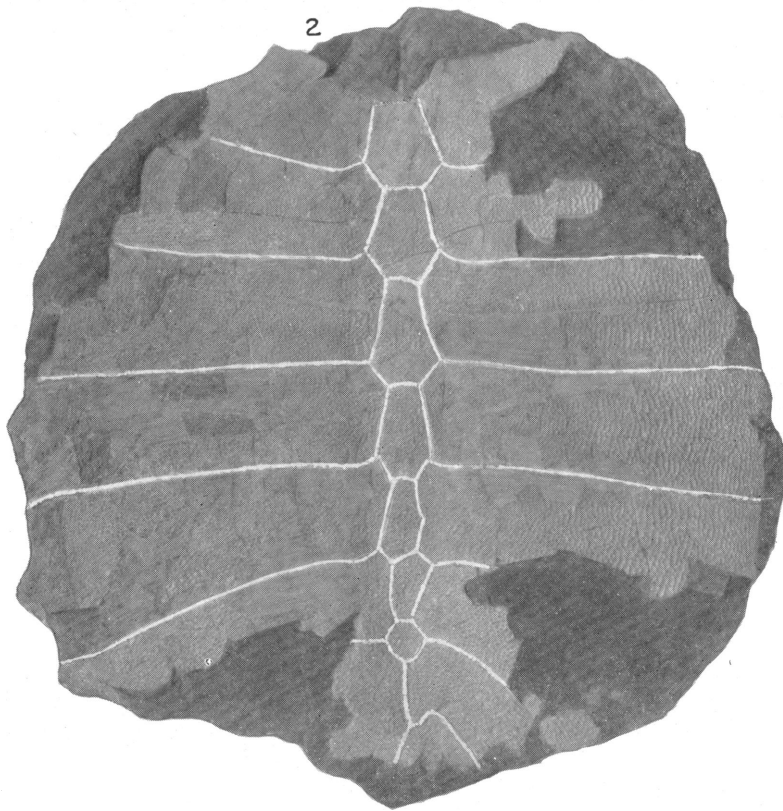


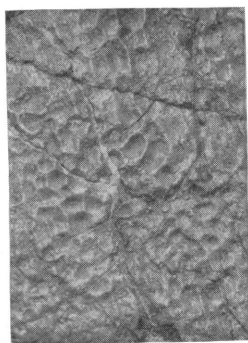
PLATE XI

Amyda? johnsoni, carapace. Type. No. 6357, A. M. N. H.

Fig. 1. Carapace. $\times 3.5$.

Fig. 2. Part of sixth costal showing character of sculpture. $\times 1$.

2



1



